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Case Report

Escherichia Coli Brain Abscess in an Immunocompetent Adult: Case Report

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Summary

Background: Escherichia coli (E. coli) is the main bacterium responsible for neonatal meningitis. Cases brain abscess and subdural empyema due to E. coli are extremely rare in immunocompetent adults. We present here the case of a patient with intravenous drug addiction as a risk factor, who developed an E. coli brain abscess following a simple urinary tract infection.

Keywords: ***Escherichia coli, Brain abscess, Urinary tract infection, Septic embolus, Encephalomyelitis.***

Introduction

Despite the advent of modern neurosurgical techniques, new antibiotics and high- performance imaging technologies, brain abscess remains a potentially fatal infection of the central nervous system (CNS) [1,2].

Escherichia coli is a gram-negative rod found in the gastrointestinal tract, forming part of the normal flora, and typically non-pathogenic [3]. In adults, extra-intestinal infections usually occur as part of a translocation, with the urinary tract being the most common site of infection [3]. We report here a rare case of E. coli brain abscess with a urinary tract origin in an immunocompetent subject.

Case presentation

The patient was a 38-year-old male drug addict and prison inmate with no previous pathological history, admitted to our department with encephalomyelitis characterized by consciousness disorders, aphasia and progressive tetraplegia, which had been evolving for 15 days prior to admission. Clinical examination revealed an obnubilated patient with a Glasgow score of 13/15, a fever of 38.7°, mild neck stiffness with positive Kernig's sign, unable to hold either the barré or the mingazzini, and muscle strength in both limbs noted at 0/5th with spastic hyperrigidity, and osteo-tendinous reflexes abolished. On the respiratory level, pleuropulmonary examination revealed basithoracic crackling rales in both lung fields; the patient also presented with poor oral and dental status and self- mutilation scars. The rest of the clinical examination was unremarkable. A cerebral CT scan revealed multiple foci of non-compressive fronto-parietal nodular and patchy hypodensity (**Figure 1**). A complementary cerebral MRI scan was performed, which revealed a multifocal ischemic stroke in the right middle cerebral territory, the posterior junctional territory and the superficial territory of the left ACM, with the onset of subfalcic involvement due to thrombosis of both internal carotids and thrombosis of the right lateral sinus (septic embolus); a lumbar puncture was performed, showing cellularity of less than three elements, normoglycorachy and normoproteinorachy. A neuromeningeal PCR isolated E. coli. A thoraco-abdomino-pelvic CT scan showed minimal ureterohydronephrosis with no detectable obstruction, a heterogeneous prostate and minimal right pleural effusion. Biological findings included a hyperleukocytosis of 24,060/µL, predominantly neutrophils (PNN), thrombocytosis of 670,000/µL, polycythemia of 18.6 g/dL, CRP of 106.01 mg/L and procalcitonin of 0.23 ng/mL. ECBU showed leukocyturia at 179,200/ml with polymicrobial culture. Two trans-thoracic ultrasounds (TTE) performed one week apart were normal. Blood cultures returned sterile. HIV, HBV and HCV serologies, requested in the context of drug addiction, were negative. A myelogram, performed because of the hyperleukocytosis, thrombocytosis and polycythemia, showed a cytological appearance in favor of a reaction marrow. Thrombophilia work-up was normal.

The diagnosis was E. coli brain abscess, with a urinary origin (prostatitis) and septic emboli leading to ischemic stroke. The patient was initially treated with triple antibiotic therapy: ceftriaxone 2 g x 2/day, metronidazole 500 mg x 3/day, and gentamicin 5 mg/kg/day. However, due to lack of improvement, and in view of the history of intravenous drug abuse and the presence of self-mutilation scars, antibiotic therapy was extended to vancomycin 30 mg/kg/day and imipenem 1 g x 3/day, also targeting prostatitis. A curative dose of anticoagulant therapy was also initiated.

The clinical course was marked by respiratory and neurological worsening. The patient's Glasgow score dropped to 9/15 with respiratory distress. Given this situation, he was transferred to intensive care for further management.

Unfortunately, the patient died on the tenth day of well-adapted treatment, as a result of complications linked to his disease.

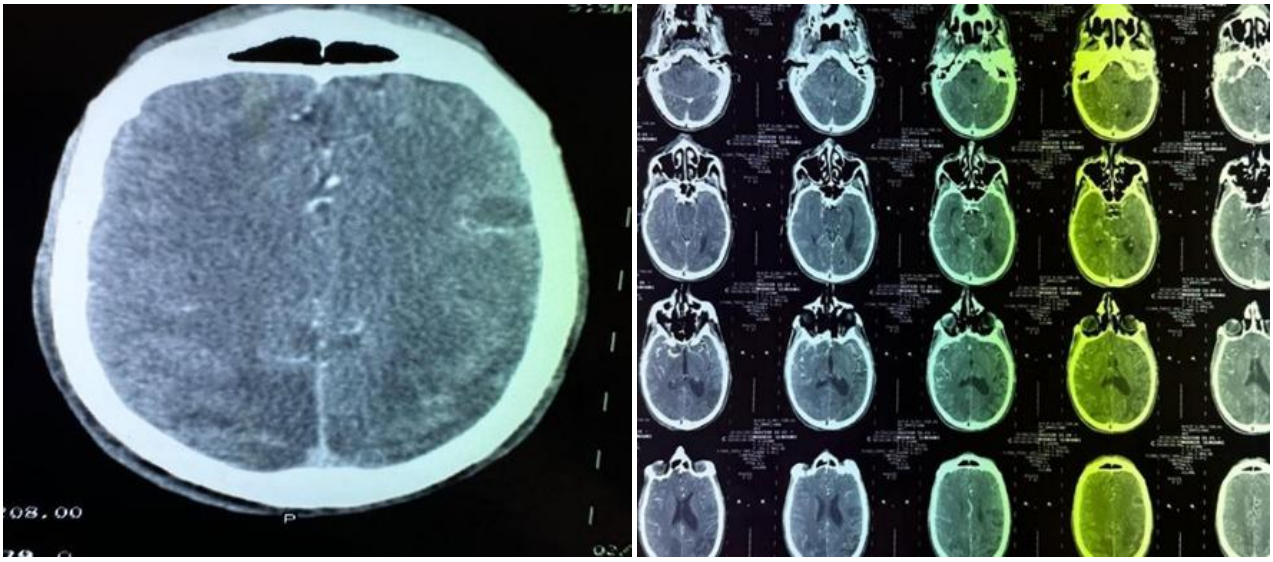

Figure 1: Cerebral CT: Spiral acquisition in millimeter slices with and without injection of contrast medium.

Multiple foci of non-compressive fronto-parietal nodular and patchy hypodensity; patchy left parietal cortico-subcortical hypodensity with sequelae.

Discussion

Aerobic and anaerobic streptococci are the most common pathogens in brain abscesses, due to their contiguous spread. Hematogenous dissemination of other pathogens is observed in 15-30% of cases [4], from a distant infection site such as a lung abscess, pleural empyema, skin infection or intra-abdominal infection. Urinary tract infections can lead to metastatic brain abscesses, and species of enterobacteria and Pseudomonas have been reported as causative pathogens [4,5], as illustrated by the case of our patient, who developed an E. coli brain abscess following untreated prostatitis.

Gram-negative bacillus brain abscesses of nosocomial origin are common in adults who have undergone neurosurgical procedures [6,7]. On the other hand, those of community origin, although less frequent, occur mainly in people with impaired immune function [4]. In newborns, E. coli and group B streptococci are known to be the bacteria responsible for neonatal meningitis [8]. In adults, however, community-acquired E. coli meningitis is rare, except in patients with comorbidities [9]. In a Danish study involving 36 adults with community-acquired E. coli meningitis, it was found that the elderly and immunocompromised patients were most affected. E. coli bacteremia was found in 26 patients, 13 of whom had an identified urinary route of entry. The case-fatality rate was very high [10]. Another French cohort study, carried out in an intensive care unit on 40 cases of Gram-negative meningitis of community origin, 23 of which were due to E. coli, showed that urinary tract infection was identified in 40% of cases [11]. In the literature, however, case-fatality rates for patients with E. coli meningitis were high (36%), compared with pneumococcal (20%) and meningococcal (7%) meningitis [12,13]. Systemic complications were responsible for death in 92% of patients, with sepsis and multivisceral failure having more serious consequences than neurological complications. In our case, the lumbar puncture was strictly normal, apart from a neuromeningeal PCR which isolated E coli.

E. coli brain abscesses are much rarer than meningitis. Few data have been reported in the literature; only nine cases of intracranial E. coli abscesses in adults, including cerebral abscesses or subdural empyema, have been described in the last 20 years [9-14]. Interestingly, eight of the nine patients reported were elderly men, suggesting that age and gender may be important risk factors. Other risk factors for intracranial E. coli infection include chronic alcoholism, cirrhosis, HIV infection, chronic obstructive pulmonary disease, use of immunosuppressive drugs and diabetes mellitus [15]. Our patient had a single risk factor, namely chronic alcoholism.

A 15-year retrospective study in Denmark, including 102 patients with pyogenic brain abscess, revealed that the median age was 47 years, and 65% of patients were male. The median time from symptom onset to admission was 7 days. The source of infection was contiguous in 36%, hematogenous in 28%, traumatic in 9% and unknown in 27%. Adverse outcome was associated with a low Glasgow score on admission, the presence of comorbidities and intraventricular rupture of the abscess [16]. Our observation is consistent with the results obtained by Helweg-Larsen *et al.* [16].

The main prognostic factors identified were the state of consciousness on admission and the presence of comorbidities. Mortality is generally higher in cases of impaired consciousness, rapidly progressing neurological damage or predisposing disease[17].

In this observation, our patient presented with an initial Glasgow score of 13/15, and the symptomatology dated back to two weeks before admission. In addition to the prognostic factors mentioned, delay in diagnosis can also be considered a poor prognostic factor, The unfavorable evolution can also be explained by the fact that antibiotic therapy was initially inappropriate, given the high prevalence of extended- spectrum beta-lactamase (ESBL)-producing E. coli in our country. A retrospective study conducted over a three-year period, assessing the frequency of isolation and antibiotic resistance of uropathogenic E. coli strains isolated in the Marrakech region, revealed high rates of resistance. Analysis revealed that 65% of strains were resistant to amoxicillin, 55% to sulfamethoxazole- trimethoprim, 43% to amoxicillin-clavulanic acid, 22% to ciprofloxacin, 14% to gentamicin, 11% to nitrofurans, 8% to amikacin and 7% to fosfomycin. With regard to resistance to third-generation cephalosporins (C3G), 67 strains of E. coli were resistant through the production of extended-spectrum ß-lactamases (ESBL), representing a frequency of 4.5% among all uropathogenic Enterobacteriaceae isolated. Among ESBL-producing strains, no resistance to imipenem has been recorded, i.e. 100% sensitivity to imipenem [18]. Treatment should cover the majority of E. coli strains in areas where the prevalence of ESBL or carbapenemase (CPO) producers is low. However, treatment with carbapenem or colistin/polymyxin B should be considered if an ESBL- or CPO-producing pathogen is suspected [19].

Conclusion

We have encountered a rare case of brain abscess following a simple E. coli urinary tract infection. The formation of brain abscesses due to the hematogenous spread of E. coli is very rare. But it can lead to serious complications. Immunosuppression can contribute to the development of intracranial E. coli abscesses, such as cerebral abscesses and subdural empyema. Advanced age may also be an important risk factor.

Declarations

Ethical Approval

This study did not require ethical approval as it is a case report based on anonymized clinical observations.

Consent to Participate

Informed consent was obtained from the patient's family for the use of their medical data for research purposes.

Consent to Publication

Informed consent for the publication of the data and results of the study was obtained from the patient's family.

Availability of Data and Material

The clinical data and materials used in this study are available upon request, subject to compliance with ethical and legal requirements regarding patient confidentiality.

Competing Interests

I declare that I have no competing interests related to this article.

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Author Contributions

Rania El Fargani: Study design, data collection, data analysis, and manuscript writing.
Idalene Malika: Contribution to the clinical data analysis and critical revision of the manuscript.
Wiam Ait Driss: Contribution to data collection and manuscript revision.
Tassi Noura: Contribution to manuscript revision and data analysis.

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