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Brain abcess with *Nocardia Farcinica*

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ABSTRACT

Introduction: Brain abscesses caused by *Nocardia farcinica* pathogen are rare and usually present as large abscesses with a thick and irregular wall. We present a case of a patient with signs and symptoms of central nervous system infection and had a fulminant evolution with malign cerebral oedema and death.

Case report: The 35-year-old patient presented with mild symptoms that appeared 2 weeks prior and became more aggressive in the last 48 hours. After the initial examination and blood tests, the patient was suspected of a systemic infection because of the high white cell count and high level of inflammatory markers. Antibiotic therapy was started with Ciprofloxacin and Amoxicillin/ Clavulanic Acid. The brain MRI showed a multinodular lesion in the right hemisphere, with contrast enhancement and central high diffusion restriction on T1, T2 and FLAIR. During the antibiotic treatment, the patient suddenly became comatose. Urgent brain CT scan showed malign cerebral oedema with brain shift.

Discussion: There are 58 documented cases of *Nocardia farcinica* in the literature, as shown in a recent systematic review. Most of the cases are with immunocompromised patients, either through disease or secondary to treatment after organ transplant. In our case, we suspected immunodeficiencies based on the anamnestic data offered by the patient's family. Mortality rates are between 19% and 36,7% in all reported cases, but in our presented case the patient had a rapid aggressive evolution with malign brain oedema that resulted in death.

Conclusions. The management of these cases requires urgent diagnostics and treatment. For our team, the first reported case of *Nocardia farcinica* and the fast aggressive evolution resulted in a negative outcome, even with antibiotics treatment and surgical evacuation of the abscess.

Keywords
brain abscess,
nocardia farcinica,
infection,
central nervous system

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INTRODUCTION

Nocardial brain abscesses are a serious and quite rare pathology caused by bacteria from the genus Nocardia, a group of gram-positive aerobic bacilli falling under the broader umbrella of aerobic actinomycetes (Loeffler et al., 2001; Prod'hom & Bille, 2017). Soil-based, these bacteria usually enter the body either by inhalation or local contamination of damaged skin (Corsini Campioli et al., 2021). Of these, *N. farcinica* is one of the more virulent species due to additional virulence factors (Prod'hom & Bille, 2017). The manifest infection usually presents as large abscesses with a thick, irregular wall with

multilocular abscesses not being uncommon. The preferred locations for these are the lungs and the brain (Beucler et al., 2022; Prod'hom & Bille, 2017). In the following report we will analyse the case of a patient who presented with a symptomatic nocardial abscess with *N. farcinica* leading to malign cerebral oedema and death.

CASE REPORT

We present the case of a 35-year-old patient that arrived at the Emergency Department complaining of an intense headache. The symptoms started two weeks prior to the presentation and intensified in the last 48hours. The patient presented one episode of vomiting which alleviated his symptoms.

On initial examination, the patient was alert, responsive but agitated with mild neck stiffness. We observed a generalized skin erythema and multiple tattoos. A cranial CT was performed (Figure 1) in which a nodular parenchymal lesion was observed in the right hemisphere. The lesion showed important perilesional digitiform oedema. Complementary tests were performed including serologies, HIV and QuantiFERON test. Blood test showed leucocytosis, thrombocytosis with high levels of fibrinogen and ESR. Tests for syphilis, tuberculosis and HIV were negative.

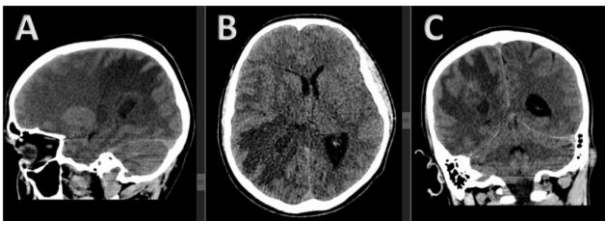

Figure 1. Initial Brain CT scan without contrast showing one nodular lesion in the right hemisphere on sagittal (A), axial (B) and coronal (C) planes. Perilesional digitiform oedema shown in the blue circle.

The family of the patient noted that he worked for 6 years in Barcelona, Spain, undocumented and is a frequent user of drugs and alcohol.

We performed a thoracic radiograph that showed multiple focal lesions bilaterally. We followed up with a thoracic CT scan that showed multiple cystic lesions with thin wall located in the superior lingula lobe and in the left Fowler segment with antero-posterior diameter of 24/15 mm and respectively 17/10mm. On the left inferior pulmonary lobe, it was found a cyst lesion with a 7,5 mm and 1,8 mm diameter (Figure 2).

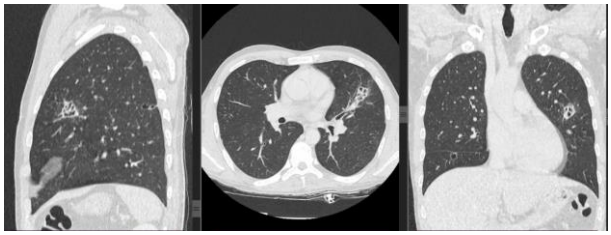

Figure 2. Thoracic CT scan showing multiple pulmonary cystic lesions (illustrated with the blue circle) with thin wall located in the superior lingula lobe and in the left Fowler segment with antero-posterior diameter of 24/15 mm and respectively 17/10mm. On the left inferior pulmonary lobe, it was found a cyst lesion with a 7,5 mm and 1,8 mm diameter.

Empirical antibiotic therapy was started with Ciprofloxacin 400mg per day + Amoxicillin/ Clavulanic Acid 6g per day.

In the following day he developed a high fever, a cough and became agitated and delirious. The symptoms did not respond to treatment.

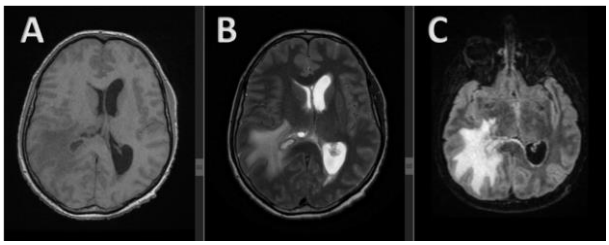

Figure 3. Brain MRI showing the heterogenous lesion in the right hemisphere, with extension in the right trigone of the lateral ventricle. The lesion shows central high diffusion restriction on T1 (A), T2 (B), FLAIR (C).

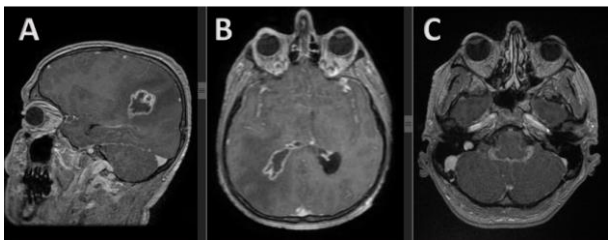

Figure 4. Brain MRI shows contrast ring enhancement on sagittal (A) and axial (B) plane. At the basal cisterns the contrast enhancement is suggestive for pachymeningitis (shown with blue arrows).

A brain MRI was performed showing an heterogenous lesion in the right hemisphere, located in the parietal lobe with extension in the right trigone

of the lateral ventricle without and evident delimitation. The lesion shows central high diffusion restriction on T1, T2 and FLAIR, with a low SWI signal (Figure 3). On T1 with contrast it presented ring and meningeal enhancement, especially at the basal cisterns. Furthermore, brain oedema was perilesional with digitiform aspect. All of these radiological features were suggestive of brain abscess and pachymeningitis (Figure 4).

On the 4th day of his stay, he suddenly became comatose and underwent urgent brain CT scan, that showed and important perilesional oedema with mass effect. A decompressive craniectomy was performed and the brain abscess was evacuated with ultrasonography guide for microbiological evaluation (Figure 5).

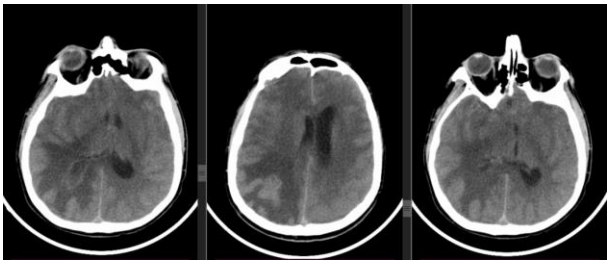

Figure 5. Brain CT scan performed on the 4th day of admission showing perilesional oedema with brain (illustrated with red circle in all images) with brain shift.

The brain abscess had multiple fibrin cells, PMN and macrophages, with negative bacterioscopy. Microbiological cultures revealed a gram-positive bacterium, Nocardia farcinica.

Postoperatively, the patient remained in comatose state, with fixed bilateral dilated pupils and the following day had a heart arrest that did not respond to resuscitation.

Discussion

Epidemiology

Brain abscesses with *N. farcinica* are a rare pathology, a recent systematic review describing only 58 completely documented cases in literature (Beucler et al., 2022). It seems that amongst nocardial infections, *N. farcinica* is a common pathogen involved in the formation of brain abscesses. There are differences in regions between The United States and Switzerland where it is the most common, and France and Italy where it was the second most common species.(Boiron et al., 1992; Corsini Campioli et al., 2021; Farina et al., 1995; Loeffler et al., 2001). In our case, this is the first documented instance of a nocardial brain abscess for our team.

The patients are generally immunocompromised. In his review, Beucler et al. reported that 74% of cases presented some form immunodeficiency whether through disease or secondary to treatment in case of organ transplant (Beucler et al., 2022). In other series immunodeficiencies were present in 83,3%, 70.5%, 90%, 62.5% and 82% of cases respectively (Anagnostou et al., 2014; Boiron et al., 1992; Corsini Campioli et al., 2021; Farina et al., 1995; Loeffler et al., 2001), one of them reporting cases of immunodeficiencies associated with drug abuse (Farina et al., 1995). In our case, no apparent immunocompromising factors were identified. The patient had white cell counts concurrent with normal response during infectious pathologies and the tests for syphilis, tuberculosis and HIV were all negative. The only reference we have is anamnestic data from the family about alleged drug abuse (unspecified) and chronic alcohol abuse which are both proven to induce a degree of immunodeficiency (Kaushik et al., 2011; Pasala et al., 2015), however only circumstantial evidence is available.

In our case the patient died 5 days after admission due to malign cerebral oedema combined with the systemic infection diagnosed. Mortality rates are high in all reported series ranging between 19% and 36.7% (Anagnostou et al., 2014; Beucler et al., 2022; Boiron et al., 1992; Corsini Campioli et al., 2021; Farina et al., 1995; Loeffler et al., 2001). Amongst these, higher mortality in nocardial infections with CNS determination was observed in immunocompromised patients: 57%, 55%, 64% (Corsini Campioli et al., 2021; Loeffler et al., 2001; Mamelak et al., 1994) rather than in immunocompetent hosts: 20%,42% (Loeffler et al., 2001; Mamelak et al., 1994). *N. farcinica* was by far the more aggressive species, representing a high proportion of the deaths: 57% (Boiron et al., 1992; Kumar et al., 2014). We cannot reflect on mortality rates in our area since this is the first documented case we encountered, but we will monitor and report any further cases.

Being such a rare entity, usually associated with other pathologies like immune deficiencies whether acquired or induced through medication, clinical and paraclinical presentations vary. The presentation in most series is intracranial hypertension (45%, 50%,

33% (Anagnostou et al., 2014; Beucler et al., 2022; Loeffler et al., 2001)), concurring with the findings for our patient. No neurological deficits were identified for our case although these are also very common (51%, 50% 50% (Anagnostou et al., 2014; Beucler et al., 2022; Loeffler et al., 2001). Meningismus is quite frequent, especially when abscesses are in contact with the ventricular walls (9%, 9%, 17% (Anagnostou et al., 2014; Beucler et al., 2022; Loeffler et al., 2001)). Fever was not present in our case, and despite the classic triad of fever, elevated ICP and focal deficit, is not seen in most cases, probably due to the immunodeficiencies related with this pathology. (Anagnostou et al., 2014; Beucler et al., 2022; Loeffler et al., 2001).

When it comes to paraclinical tests, an inflammatory syndrome marked by elevated WBC CRP, fibrinogen and platelets levels was present and is a possible, although quite inconsistent finding (Beucler et al., 2022). When it comes to intracerebral radiological findings, a single abscess is most common, 59%, 66%, 83% and 57% respectively (Beucler et al., 2022; Corsini Campioli et al., 2021; Loeffler et al., 2001; Mamelak et al., 1994), mostly supratentorial 52%, 91%, 83%, 57% (Beucler et al., 2022; Corsini Campioli et al., 2021; Loeffler et al., 2001; Mamelak et al., 1994). Described as looking as a grape bunch in most cases it is associated with intense vasogenic oedema (Beucler et al., 2022), which was certainly evident in our case since it evolved with malign cerebral oedema. The parietal lobe localisation seems to be the second most common (37.5% (Corsini Campioli et al., 2021)), and explains the lack of focal neurological deficits.

Management of these cases is complex and requires both surgical intervention and long-term antibiotic therapy. The surgical approach serves both to reduce the dimensions or completely excise the abscess and to produce pathological material for microbiological identification. However, when microbiological identification is possible from a secondary location, a more conservative approach can be considered. In general, between 45% and 77% of patients benefited from surgical intervention (Beucler et al., 2022; Corsini Campioli et al., 2021; Farina et al., 1995; Loeffler et al., 2001; Mamelak et al., 1994) and this led to a positive outcome for 93% 87% and 65% of them respectively (Anagnostou et al., 2014; Beucler et al., 2022; Mamelak et al., 1994). The preferred strategy was craniotomy an excision as opposed to aspiration and drainage since it led to better results 8% and 24% mortality versus 23% and 50% mortality respectively (Beucler et al., 2022; Mamelak et al., 1994), with a lower risk of surgical revision 8% vs 31% (Beucler et al., 2022), 22% vs 27% (Mamelak et al., 1994). Antibiotic treatment usually employed trimethoprim-sulfamethoxazole (TMP-SMX) in 45%, 41,6%, 90% (Beucler et al., 2022; Corsini Campioli et al., 2021; Mamelak et al., 1994) of cases usually associated with other antibiotics such as vancomycin, amikacin, metronidazole, ceftriaxone, minocycline and amoxicillin. (Corsini Campioli et al., 2021; Farina et al., 1995; Loeffler et al., 2001; Mamelak et al., 1994). In vitro studies showed the most susceptibility to TMP-SMX, linezolid, amikacin, imipenem and meropenem, minocycline (Beucler et al., 2022; Corsini Campioli et al., 2021; Mamelak et al., 1994). Other studies in Italy and France showed resistance to TMP-SMX, and high susceptibility to amikacin (Boiron et al., 1992; Farina et al., 1995), but these were not focused on *N. farcinica* only. Most found a high level of resistance to amoxicillin and clavulanic acid. (Beucler et al., 2022; Boiron et al., 1992; Corsini Campioli et al., 2021; Farina et al., 1995; Mamelak et al., 1994). Thus, it seems that the best empiric antibiotic treatment would combine amikacin with either TMP-SMX or imipenem, meropenem, minocycline depending on region related particularities.

Conclusions

This was the first reported case of a *N. farcinica* brain abscess in our region and represented a challenge through its particularities. The atypical presentation, the disseminated infection and the choice of treatment all contributed to the high degree of gravity of the case. Immunosuppression could not certainly be ruled out in our case. Management of these cases require prompt identification of the bacteria, aggressive surgical treatment, and the correct choice of antibiotic treatment. We aim to raise awareness about this pathology, seldom found in our geographical area and to further our standards of practice in these cases.

References

1. Anagnostou, T., Arvanitis, M., Kourkoumpetis, T. K., Desalermos, A., Carneiro, H. A., & Mylonakis, E. (2014). Nocardiosis of the central nervous system: experience from a general hospital and review of 84 cases from the

literature. Medicine (Baltimore), 93(1), 19-32. https://doi.org/10.1097/md.0000000000000012

2. Beucler, N., Farah, K., Choucha, A., Meyer, M., Fuentes, S., Seng, P., & Dufour, H. (2022). Nocardia farcinica cerebral abscess: A systematic review of treatment strategies. Neurochirurgie, 68(1), 94-101. https://doi.org/https://doi.org/10.1016/j.neuchi.2021.04.022
3. Boiron, P., Provost, F., Chevrier, G., & Dupont, B. (1992). Review of nocardial infections in France 1987 to 1990. Eur J Clin Microbiol Infect Dis, 11(8), 709-714. https://doi.org/10.1007/bf01989975
4. Corsini Campioli, C., Castillo Almeida, N. E., O'Horo, J. C., Challener, D., Go, J. R., DeSimone, D. C., & Sohail, M. R. (2021). Clinical Presentation, Management, and Outcomes of Patients With Brain Abscess due to Nocardia Species. Open Forum Infectious Diseases, 8(4). https://doi.org/10.1093/ofid/ofab067
5. Farina, C., Boiron, P., Goglio, A., & Provost, F. (1995). Human nocardiosis in northern Italy from 1982 to 1992. Northern Italy Collaborative Group on Nocardiosis. Scand J Infect Dis, 27(1), 23-27. https://doi.org/10.3109/00365549509018968
6. Kaushik, K. S., Kapila, K., & Praharaj, A. K. (2011). Shooting up: the interface of microbial infections and drug abuse. Journal of Medical Microbiology, 60(4), 408-422. https://doi.org/https://doi.org/10.1099/jmm.0.027540-0
7. Kumar, V. A., Augustine, D., Panikar, D., Nandakumar, A., Dinesh, K. R., Karim, S., & Philip, R. (2014). Nocardia farcinica brain abscess: epidemiology, pathophysiology, and literature review. Surg Infect (Larchmt), 15(5), 640-646. https://doi.org/10.1089/sur.2012.205
8. Loeffler, J. M., Bodmer, T., Zimmerli, W., & Leib, S. L. (2001). Nocardial Brain Abscess: Observation of Treatment Strategies and Outcome in Switzerland from 1992 to 1999. Infection, 29(6), 337-341. https://doi.org/10.1007/s15010-001-1147-1
9. Mamelak, A. N., Obana, W. G., Flaherty, J. F., & Rosenblum, M. L. (1994). Nocardial brain abscess: treatment strategies and factors influencing outcome. Neurosurgery, 35(4), 622-631. https://doi.org/10.1227/00006123-199410000-00007
10. Pasala, S., Barr, T., & Messaoudi, I. (2015). Impact of Alcohol Abuse on the Adaptive Immune System. Alcohol Res, 37(2), 185-197.
11. Prod'hom, G., & Bille, J. (2017). 178 - Aerobic Gram-Positive Bacilli. In J. Cohen, W. G. Powderly, & S. M. Opal (Eds.), Infectious Diseases (Fourth Edition) (pp. 1537-1552.e1532). Elsevier. https://doi.org/https://doi.org/10.1016/B978-0-7020-6285-8.00178-7