NASCER E CRESCER
BIRTH AND GROWTH MEDICAL JOURNAL
year 2024, vol 33, n.º 4

Nascer e Crescer - Birth and Growth Medical Journal
2024;33(4):278-282. doi:10.25753/BirthGrowthMJ.v33.i4.31033

CASE REPORTS

A rare case of brain abscess following professional dental cleaning

Um caso raro de abcesso cerebral após realização de higienização dentária profissional

Lisa Pereira Soares[1], Beatriz Bonança Pedreira[1], Paulo Rego Sousa[2]

ABSTRACT

Brain abscess is a rare infection of the central nervous system in childhood. The clinical presentation is usually nonspecific, making its diagnosis challenging. The etiology is varied. Less invasive oral procedures are a rare potential cause of hematogenous dissemination of microorganisms to the brain.

Herein is presented the case of an adolescent who presented to the Emergency Department with complaints of headache three weeks after a professional dental cleaning. A brain abscess was diagnosed and *Streptococcus viridans*, usually associated with oral mucosal infections, was isolated. The boy was successfully treated with needle aspiration of the abscess and a six-week course of antibiotic therapy.

This case highlights the importance of improving knowledge of this entity to ensure timely diagnosis and treatment, ultimately improving patient outcomes.

Keywords: adolescent; brain abscess; headache; streptococcal infection; tooth

RESUMO

O abcesso cerebral é uma infeção do sistema nervoso central rara em idade pediátrica. A apresentação clínica é muitas vezes inespecífica, tornando o diagnóstico desafiante. A etiologia é variada. Os procedimentos orais pouco invasivos são uma causa potencial rara de disseminação hematogénea de microrganismos para o cérebro.

É apresentado o caso de um adolescente que recorreu ao Serviço de Urgência devido a um quadro de cefaleias três semanas após uma higienização dentária. Foi diagnosticado um abcesso cerebral, tendo sido isolado *Streptococcus* do grupo *viridans*, habitualmente associado a infeções com origem na mucosa oral. O adolescente foi submetido a punção aspirativa do abcesso e cumpriu antibioterapia durante seis semanas, com boa evolução.

Este caso alerta para a importância de melhorar o conhecimento sobre esta entidade para permitir o seu reconhecimento e tratamento atempados, com melhor prognóstico dos doentes.

Palavras-chave: abcesso cerebral; adolescente; cefaleia; dente; infeção estreptocócica

1. Department of Pediatrics, Hospital Dr. Nélio Mendonça. 9000-177 Funchal, Portugal
a.l.p.soares@gmail.com; beabopedreira@gmail.com
2. Neuropediatrics Unit, Department of Pediatrics, Hospital Dr. Nélio Mendonça. 9000-177 Funchal, Portugal
pregosousa@gmail.com

INTRODUCTION

Brain abscess is a focal infection of the brain parenchyma. It is particularly rare in children, with a global incidence of approximately 0.3-1.8 cases per 100,000 inhabitants per year.[1,2] The infection may be caused by hematogenous dissemination from a distant infectious focus (e.g., cases of bacterial endocarditis, dental focus, or pulmonary infection). It may be due to a penetrating lesion of the central nervous system (CNS) or, in most cases, from an adjacent infectious focus such as sinusitis or otitis.[1-3]

In cases of dental infection, there is usually a history of oral disease such as tooth cavities, periodontitis, or gingivitis, or a history of an invasive dental procedure such as a dental extraction, on average two to three weeks prior to the onset of symptoms.[4] In rare cases, this procedure may be minimally invasive. Professional tooth cleaning is responsible for 4% of all cases of brain abscesses of oral origin.[4]

CASE REPORT

A 12-year-old adolescent male presented to the Emergency Department with complaints of a frontal pulsating headache of seven out of ten intensity with five days of evolution. The headache was aggravated by movement and was accompanied by sleepiness and photophobia. The boy reported that he woke up during sleep because of pain and had some episodes of vomiting. He was apyretic most of the time except for the first day, when he was subfebrile, and had a history of professional dental cleaning three weeks before.

On presentation, the boy was prostrate. The physical and neurological examinations were unremarkable, and blood test showed a C-reactive-protein of 9.03 mg/L and no leukocytosis. A computed tomography scan was performed and showed a round lesion in the left inferior temporal region with a necrotic cystic appearance surrounded by vasogenic edema causing effacement of the adjacent sulci and remodeling of the temporal horn of the lateral ventricle (**Figure 1**). Magnetic resonance imaging (MRI) was performed to characterize the lesion and showed an intra-axial expansive lesion measuring 29.8 mm in diameter, compatible with an abscess (**Figure 2**).

Treatment with cefotaxime, vancomycin, and metronidazole was initiated, along with corticosteroid therapy with dexamethasone and prophylactic anticonvulsant therapy with levetiracetam.

Blood mycobacteriology, urine culture, stool culture, tuberculin skin test, nasal swab screening for methicillin-resistant Staphylococcus aureus, serologic testing for human immunodeficiency virus and toxoplasmosis, and fecal parasitologic analysis were performed before starting treatment.

The patient was admitted to the Intensive Care Unit (ICU), where needle aspiration of the abscess through a left temporal inferior craniotomy was performed without complications. After seven days in the ICU, he was transferred to the Pediatric Department. Multi-susceptible *Streptococcus intermedius*, a member of the viridans group of streptococci, was isolated from the drained pus. Antibiotic therapy with vancomycin and metronidazole was discontinued. All other tests were negative.

During hospitalization, follow-up MRI was performed in the first and second weeks after aspiration and showed progressive reduction of the abscess cavity and surrounding edema (**Figure 3**). There was also improvement in headache and no ictal events were recorded.

Cardiac evaluation with echocardiogram, chest x-ray, abdominal echography, and immunodeficiency workup (including immunoglobulin measurement, lymphocyte subset analysis, protein electrophoresis, and complement) were also performed and were all normal.

After receiving the culture results, a dental examination and orthopantomography were performed, both without relevant findings.

The patient was discharged after four weeks of intravenous antibiotic therapy and continued oral antibiotic therapy with amoxicillin and clindamycin for two weeks according to antibiotic susceptibility testing. He remained asymptomatic at the six-month follow-up.

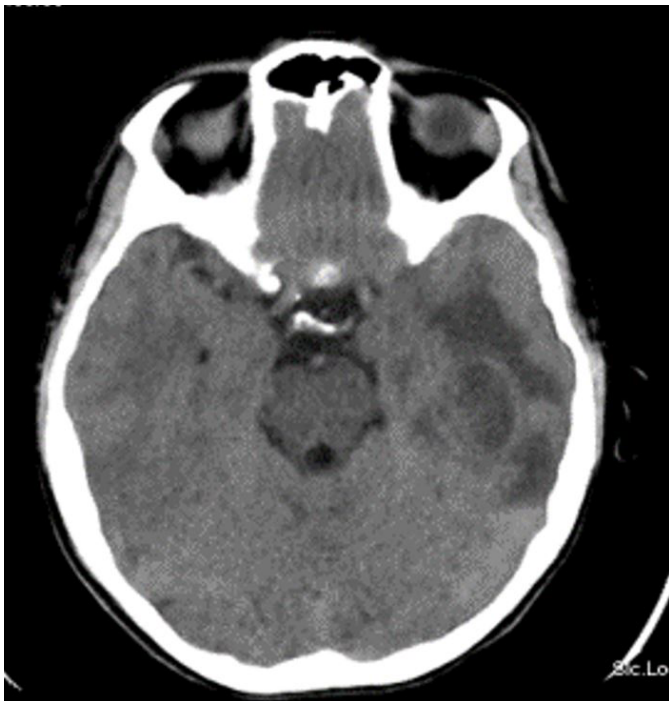

Figure 1 - Brain computed tomography showing a round lesion in the left inferior temporal region.

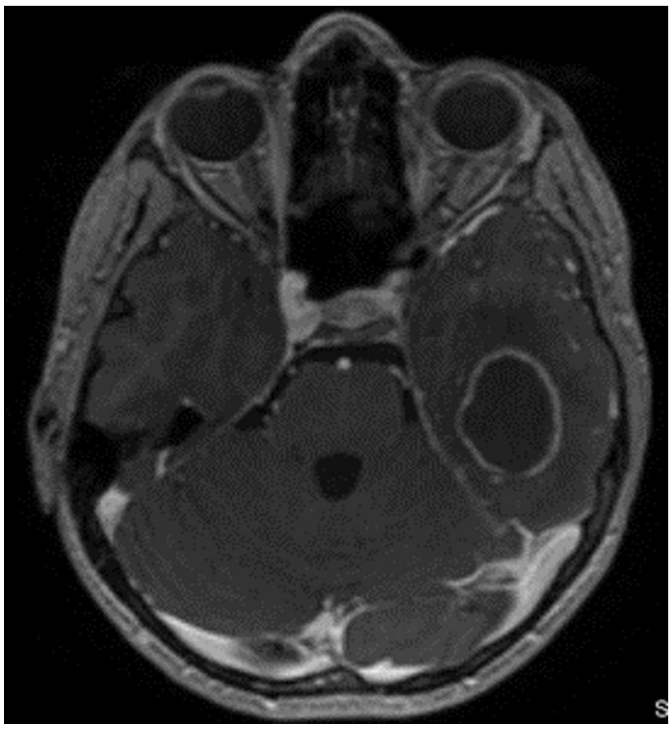

Figure 2 - Brain magnetic resonance imaging. Axial T1 with gadolinium. Intra-axial lesion with a long axis of 29.8 mm.

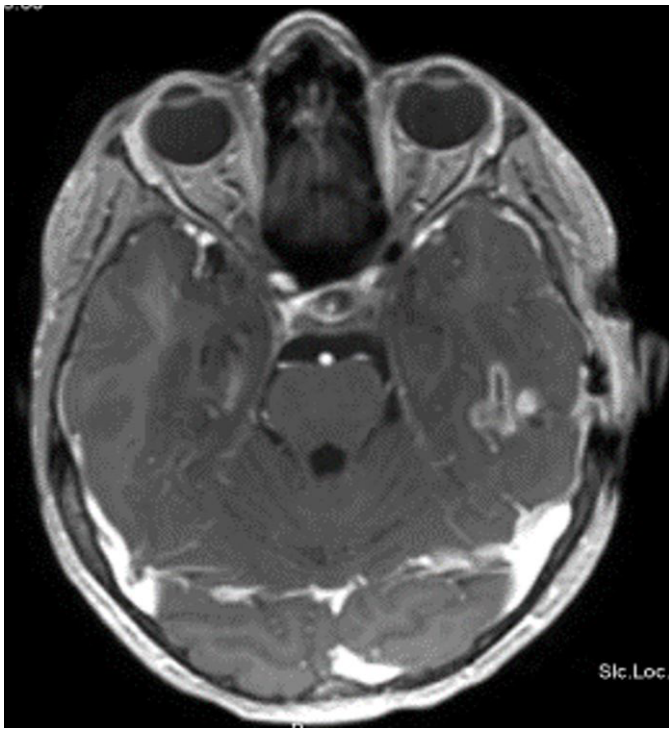

Figure 3 - Brain magnetic resonance imaging. Axial T1 with gadolinium.
Improvement of the lesion with reduction in size after two weeks.

DISCUSSION

The clinical presentation of brain abscesses is variable, depending on the location, extent of the main lesion and surrounding edema, number of lesions, virulence of the causative agent(s), and age of the patient.[3,5] The most frequently reported symptom is headache, but fever, seizures, hemiplegia, cranial nerve palsies, altered level of consciousness, vomiting, and photophobia may also be present.[1-5] On average, these symptoms are present 8.3 days before diagnosis. On neurologic examination, papilledema is found in half of the reported cases, and focal neurologic deficits are also common.[5]

In this case, because the headache was longstanding and awakened the patient from sleep, a CT scan was performed to rule out a structural brain lesion. The lesion found on this examination had imaging features suggestive of either a brain abscess or a tumor, the main differential diagnosis.[2,6] MRI is useful in differentiating abscess from cystic or neoplastic lesions.[1]

There was no remarkable increase in inflammatory markers on admission, which is consistent with the literature, according to which the probability of finding altered blood tests is low.[1] After diagnosis, it is important to start antibiotic therapy with broad-spectrum agents that cross the blood-brain barrier and are active against anaerobic agents, streptococci, staphylococci, and enterobacteriaceae.[2,5] Recommended therapy includes a third-generation cephalosporin, metronidazole, and vancomycin, the latter especially in cases of penetrating trauma or a history of recent neurosurgery.[1]

In the absence of severe neurological impairment (Glasgow Coma Scale >12) and the presence of a small abscess (< 2.5 cm) or multiple abscesses with a known etiology, a conservative medical approach with close monitoring can be followed. However, in the clinical case described, it was decided to pursue a neurosurgical approach due to the presence of a single lesion larger than 2.5 cm in diameter and to shorten the duration of antibiotic therapy.[1,5]

Neurosurgical treatment has the advantages of reducing intracranial pressure, confirming the diagnosis, obtaining material for etiologic diagnosis, increasing the efficacy of antibiotic therapy, and preventing the spread of infection.[5] Two treatment options can be considered: aspiration or excision of the abscess. The first is the preferred approach, particularly for deep or multiple lesions, when eloquent areas are involved, or when there is a high risk of complications. The second is preferred for posterior cranial fossa locations and multiloculated abscesses and is associated with a longer hospital stay and higher risk of neurological impairment and epilepsy.[1,5] In this case, needle aspiration was performed due to the location of the lesion and potential risk of complications.[1,5] At the same time, corticosteroids were given for a short period of time. This strategy can be recommended in the perioperative period when there is a significant mass effect to reduce edema and potential neurologic sequelae.[1,2,5]

In cases of brain abscess in previously healthy adolescents, it is essential to perform a comprehensive etiologic study to determine

its origin. Because the lesion was unique and located in the temporal region, dissemination from a contiguous infectious focus was initially hypothesized, namely otitis, mastoiditis, or sphenoidal sinusitis, but there were no clinical or imagiologic findings compatible with any of these hypotheses.[1,2] The patient had no known history of immunosuppression, making a brain abscess due to *Aspergillus sp*. or *Toxoplasmosis gondii* unlikely.[7-9] In addition, he had no history of traveling outside the country or consuming undercooked pork, making *Taenia solium* infection less likely.[9] After ruling out congenital heart disease or infectious endocarditis, respiratory pathology, intra-abdominal infectious focus, cutaneous lesions, tuberculosis, parasitologic infection, recent head trauma, and congenital or acquired immunosuppression, the only relevant finding was a history of professional teeth cleaning three weeks before presentation to the Emergency Department. In support of this assumption, the culture results identified viridans streptococci, which are typical oral mucosal bacteria.[4] This is consistent with the literature, which indicates that the most common agents responsible for brain abscesses due to intraoral disease are viridans streptococci (subgroup *Streptococcus anginosus*, *Streptococcus constellatus*, *Streptococcus intermedius*), or anaerobes such as *Actinomyces* sp., *Prevotella* sp., *Bacteroides* sp., or *Fusobacterium* sp..[2]

Based on these findings, a dental examination and orthopantomography were performed, with normal results, suggesting the occurrence of hematogenous spread of the microorganism to the brain during the dental cleaning. In these cases, the abscess is usually located in the frontal region, but other locations have also been described.[2] Although it is a rare event, it has been described even in cases without dental or gingival disease.[4] The literature reports only three cases of brain abscess after professional tooth cleaning in pediatric age, one of which had a history of concomitant cyanotic heart disease.[10-12]

In the present case, the patient experienced no short- or medium-term complications and had a good response to therapy.

The prognosis of brain abscess has improved in recent years, with a cure rate >90%.[2] Since early detection is associated with the best outcome, this diagnosis should be considered in children with headache suggestive of intracranial hypertension, even if the neurological examination is normal or there are no obvious risk factors for brain abscess.[1] With this clinical case, the authors aimed to illustrate the management of this rare disease for which there are no defined guidelines.

AUTHORSHIP

Lisa Pereira Soares – Investigation; Writing – original draft
Beatriz Bonança Pedreira - Writing – original draft
Paulo Rego Sousa - Writing - review & editing

REFERENCES

1. Mameli C, Genoni T, Madia C, Doneda C, Penagini F, Zuccotti G. Brain abscess in pediatric age: a review. Childs Nerv Syst. 2019;35(7):1117-28. doi: https://doi.org/10.1007/s00381-019-04182-4. Epub 2019 May 6. PMID: 31062139.
2. Sonneville R, Ruimy R, Benzonana N, Riffaud L, Carsin A, Tadié JM, *et al*; ESCMID Study Group for Infectious Diseases of the Brain (ESGIB). An update on bacterial brain abscess in immunocompetent patients. Clin Microbiol Infect. 2017;23(9):614-20. doi: https://doi.org/10.1016/j.cmi.2017.05.004. Epub 2017 May 10. PMID: 28501669.
3. Krzysztofiak A, Zangari P, De Luca M, Villani A. Brain abscesses: an overview in children. Journal of Pediatric Infectious Diseases, 2017, 14.01: 002-005. doi: https://doi.org/10.1055/s-0037-1615786.
4. Moazzam AA, Rajagopal SM, Sedghizadeh PP, Zada G, Habibian M. Intracranial bacterial infections of oral origin. J Clin Neurosci. 2015;22(5):800-6. doi: https://doi.org/10.1016/j.jocn.2014.11.015. Epub 2015 Mar 21. PMID: 25800939.
5. Alvis Miranda H, Castellar-Leones SM, Elzain MA, Moscote-Salazar LR. Brain abscess: Current management. J Neurosci Rural Pract. 2013;4(Suppl 1):S67-81. doi: https://doi.org/10.4103/0976-3147.116472. PMID: 24174804; PMCID: PMC3808066.
6. Laulajainen-Hongisto A, Lempinen L, Färkkilä E, Saat R, Markkola A, Leskinen K, et al. Intracranial abscesses over the last four decades; changes in aetiology, diagnostics, treatment and outcome. Infect Dis (Lond). 2016;48(4):310-6. doi: https://doi.org/10.3109/23744235.2015.1113557. Epub 2015 Nov 23. PMID: 26592421.
7. Mohammadi H, Sadeghi S, Zandi S. Central Nervous System Aspergilloma in an Immunocompetent Patient: A Case Report. Iran J Public Health. 2015 ;44(6):869-72. PMID: 26258101.
8. Vijayakumar B, Sarin K, Mohan G. Tuberculous brain abscess and subdural empyema in an immunocompetent child: Significance of AFB staining in aspirated pus. Ann Indian Acad Neurol. 2012;15(2):130-3. PMID: 22566728.
9. Britton PN, Chaseling R. Brain abscess in a recent immigrant. J Paediatr Child Health. 2013 Mar;49(3).PMID: 23252509.
10. Fernández PB, Suárez JP, Messing-Jünger AM. Case-based update: primary intraventricular brain abscess in a 10-year-old child. Childs Nerv Syst. 2015;31(12):2235-8. doi: https://doi.org/10.1007/s00381-015-2856-6. Epub 2015 Aug 18. PMID: 26280627.
11. Viviano M, Cocca S. Multiple brain abscesses after professional tooth cleaning: Case report and literature review. J Stomatol Oral Maxillofac Surg. 2018;119(5):432-5. doi: https://doi.org/10.1016/j.jormas.2018.04.016. Epub 2018 May 7. PMID: 29747055.
12. Pallesen LP, Schaefer J, Reuner U, Leonhardt H, Engellandt

K, Schneider H, *et al*. Multiple brain abscesses in an immunocompetent patient after undergoing professional tooth cleaning. J Am Dent Assoc. 2014;145(6):564-8. doi: https://doi.org/10.14219/jada.2014.20. PMID: 24878711.

CORRESPONDENCE TO

Lisa Pereira Soares
Department of Pediatrics
Hospital Dr. Nélio Mendonça
Av. Luís de Camões 6180, São Martinho
9000-177 Funchal
Email: a.l.p.soares@gmail.com

Received for publication: 27.04.2023
Accepted in revised form: 21.02.2024