

CASE REPORT

Brain abscess caused by trauma of the rhinobasis: an endoscopic challenge

Lorand Imre Czibalmos¹, Zsafia Bere¹, Zoltan Rideg², Bela Fulop², Gabor Vass¹, Peter Gal³, Pal Barzo², Zsolt Bella¹

¹Department of Oto-Rhino-Laryngology and Head-Neck Surgery, University of Szeged, Szeged, Hungary

²Department of Neurosurgery, University of Szeged, Szeged, Hungary

³Department of Pediatrics and Pediatric Health Care Center, University of Szeged, Szeged, Hungary

ABSTRACT

Brain abscess is a rare but life-threatening infection of the brain. It often occurs as a complication of infection, trauma, or surgery. This case presents a brain abscess in a 22-month-old boy that developed after a transnasal injury with a foreign body. A minimal-invasive, transnasal, endoscopic-controlled technique was used, during which the foreign object was removed and the abscess drained. Bacteriological samples were obtained and the abscess cavity irrigated. Postoperative care included antibiotics and daily irrigation of the abscess cavity. Follow-up MRI scans showed reduction in abscess size. A spinal drain was inserted temporarily to address rhino-liquorrhoea. The patient remained asymptomatic during one-year of follow-up. This case report highlights the occurrence of a brain abscess in childhood following a transnasal injury and demonstrates a minimal-invasive, transnasal, endoscopic-controlled surgical technique. The findings underscore the importance of considering brain abscess as a potential complication in cases of head trauma, particularly in atypical presentations.

KEYWORDS: brain abscess, natural orifice endoscopic surgery, skull base surgery, foreign body, case report.

INTRODUCTION

Brain abscess is a focal infection of the cerebral parenchyma; the pus is surrounded by a well-vascularized capsule. It develops mostly as a complication of infection, trauma or surgery¹. In childhood, it is a rare, but life-threatening condition, with an approximate incidence of 25% of all brain abscess cases, and it is associated mostly with congenital heart defects and infections of the face, head or brain^{2,4}. In contrast, abscess occurring after a head trauma is even more uncommon – the reported incidence is ranging from 3 to 16% in the elderly⁵⁻⁷ – and almost negligible in childhood. The most common symptoms of brain abscess are headache, fever, altered consciousness, nausea, vomiting and focal neurological deficits; in cases of trauma, additional cerebrospinal fluid (CSF) leakage might also be detectable.

Depending on the size and localization of the abscess, surgical drainage with antimicrobial therapy is the first choice of therapy (single-sited, diameter >2.5 cm, or if it causes a mass

effect)⁸⁻¹⁰; however, small, multiplex lesions in a localization that is hard to reach via the classical neurosurgical approaches still remain a therapeutic challenge.

Authors present a unique case of brain abscess in childhood, developing after a transnasal injury, with a residual foreign object at the site of penetration. We also demonstrate a minimal-invasive, transnasal, endoscopic-controlled surgical drainage technique, applied for this specific case.

CASE REPORT

A 22-month-old boy was hospitalized at another Pediatric Department with his first classic Grand Mal epileptic seizure. Two weeks prior to the seizure, the child had been presented with massive left-sided nasal bleeding due to a trauma: he was running with a pencil in his hands when he fell over, and the pencil penetrated into the nose. However, according to his mother, the pencil had been removed intact in one piece.

Corresponding author: Zsafia Bere med. habil., Department of Oto-Rhino-Laryngology and Head-Neck Surgery, University of Szeged, Szeged, Hungary

Address: 6725 Szeged, Tisza Lajos krt. 111 Hungary

ORCID: <https://orcid.org/0000-0002-8342-1059>

e-mail: berezsafia@gmail.com

Received for publication: July 31, 2023 / **Accepted:** August 25, 2023

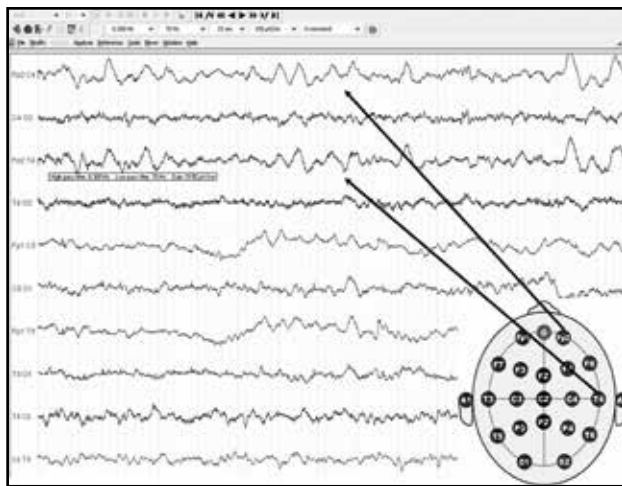


Figure 1. EEG measurement: the patient is awake, without provocation – pathological waves in the right frontotemporal/parietal leads. Arrows connect the recordings with the affected electrode sites.

The bleeding had been treated by an oto-rhino-laryngologist (ORL). According to the documentation, no foreign object had been detected during the ORL examination. After an uneventful two-week observation period, the child was admitted to our Pediatric Department for further examination of his recurrent epilepsy.

Examination

The general pediatric examination showed no neurological symptoms. The ophthalmologist excluded the sign of intracranial pressure increase (i.e., no papillary edema has been detected). Since the laboratory test indicated elevated inflammatory parameters (leukocytes:11.3 G/l C-reactive protein:120mg/l, procalcitonin: <1), and additionally, purulent nasal discharge was observed, a pediatric ORL examination was also performed: anterior rhinoscopy showed swollen

nasal mucosa, purulent discharge from the left nasal cavity, but neither foreign object or CSF leakage, nor any sign of the previous trauma was detectable. A bacteriological sample was taken from the discharge, and decongestant nasal drops (oxymetazoline 0.1 mg/ml, 3 times/day) and per os cefuroxime (15mg/kg) were prescribed.

Functional measurements

The electroencephalography (EEG) showed right frontal subcortical function failure. Figure 1 presents the original recordings: pathological slow potentials with high amplitude from the right frontotemporal-parietal leads.

Imaging

The Cranial Magnetic Resonance Imaging (MRI) highlighted the etiology of the seizure and the pathological EEG waves (Figure 2): a single abscess (with 35mm maximal diameter) could be identified in the right frontal lobe, close to the cribriform plate, connected to the left nasal cavity by a canal. Since no spontaneous abscess drainage or CSF leaking was present, but the canal was very well-visualized on the images, a hypothesis aroused, that the foreign object – the pencil from the medical history of the child – might have still been within the insertion channel.

Surgery and postoperative care

Surgery was performed under general anaesthesia. For decongestion and to reduce the swelling of the nasal mucosa, 1% epinephrine was applied topically, then the nasal cavity was examined with an endoscope (30°, 4mmx175mm). Figure 3 shows representative intraoperative pictures: in the left nasal cavity, after suctioning the mucopurulent discharge, a white foreign object was identified at a high level, in the junction of the horizontal cribriform plate (i.e., rhinobasis) and the perpendicular lamina of the ethmoid bone (i.e., bony nasal septum). With a 45° upward-angled Weil-Blakesley forceps, the foreign object (tip part of the pencil) was gently pulled out with continuous endoscopic control. After the removal of the pencil, most of the abscess

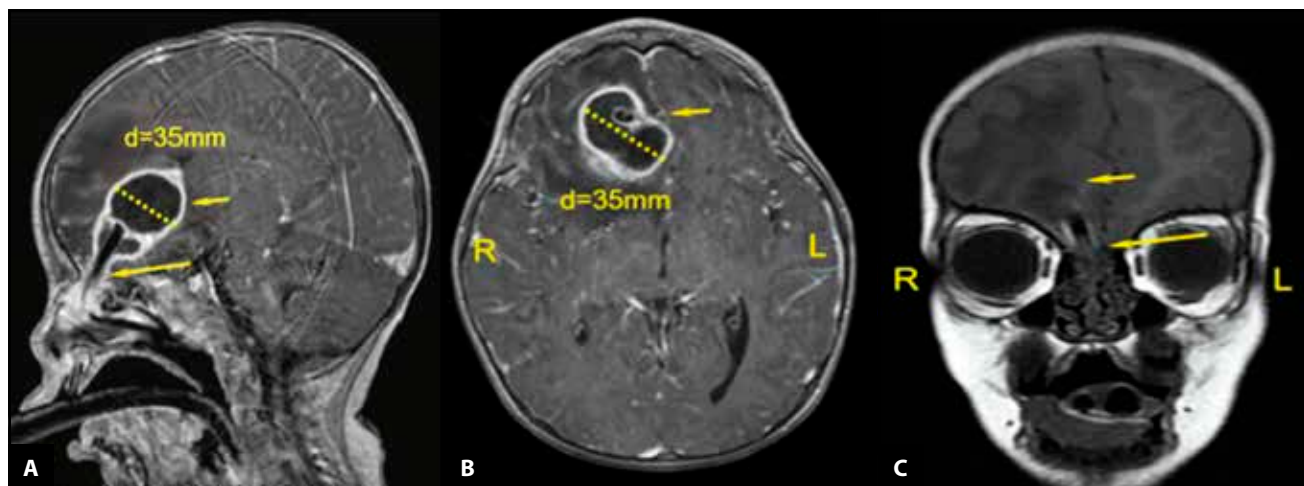


Figure 2. MRI images: **A** – sagittal, **B** – horizontal, **C** – coronal plane. Small yellow arrows on each picture point the brain abscess in the right frontal region (largest diameter = 35mm). Longer yellow arrows on images A and C show the insertion canal, originating from the left nasal cavity, passing the cribriform palate in the midline and ending in the abscess cavity in the right frontal region.

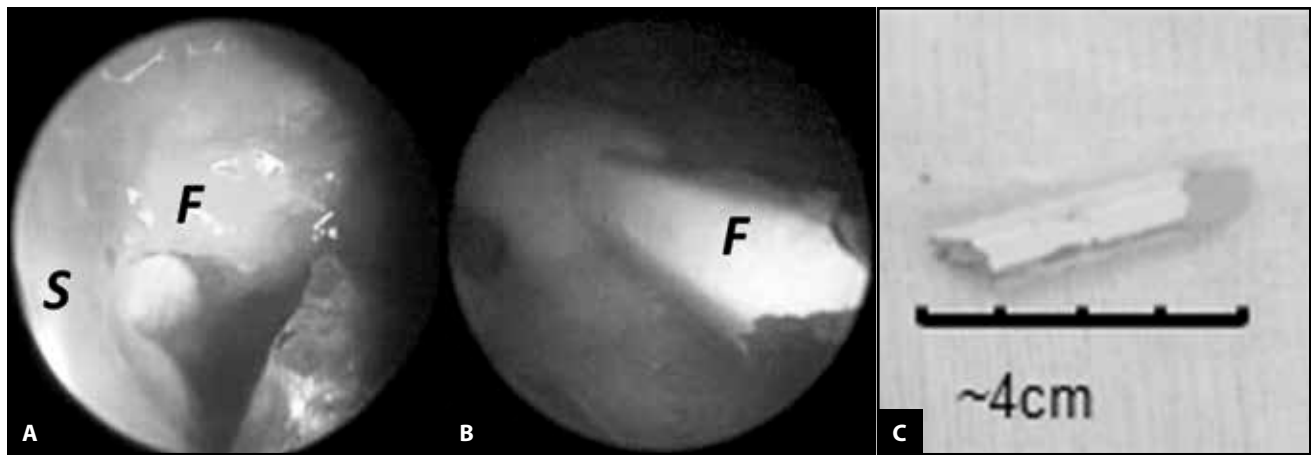


Figure 3. A, B: Intraoperative pictures with endoscopy. S: septum; F: foreign object; C: removed foreign object (broken part of a white pencil, ~4cm long).

content has spontaneously drained through the puncture canal into the nasal cavity. A bacteriological sample was taken from the purulent discharge. The endoscope was then driven into the abscess cavity, and multiple irrigations with iodine and saline solution were done. An external ventricular catheter, fixed to the nasal septum with sutures, was left in the cavity for further irrigation.

Postoperative observation was carried out at the pediatric Intensive Care Unit for 7 days. Based on the microbiological test results (Kl. Pneumoniae and B. Subtilis cultures from the abscess), a combination of vancomycin, rifampicin and Rocephin was administered parenterally. The abscess cavity was irrigated with iodine disinfectant in physiological saline solution once a day. Blood tests showed decreasing inflammatory parameters. No seizure or neurological symptom was detected during this period. The control MRI showed significant reduction in the size of the abscess cavity; therefore, the catheter was removed on the 7th postoperative day. Rhino-li-

quorrhoea was detected shortly after catheter removal, therefore a spinal drain was inserted, and CSF samples were taken daily for microbiological tests. The spinal drain was successfully removed after 10 days without any complication or any further CSF leakage. The control MRI on the 26th postoperative day showed complete regression (Figure 4). The patient was discharged on the same day from our Pediatric Department. After one-year of follow-up, the child is still asymptomatic and no neurological deficit has been presented.

DISCUSSIONS

Transnasal endoscopic approaches for pituitary pathologies and skull base tumors are routinely used nowadays as a substitution of a more traumatic external approach, with a better aesthetic result^{11,12}. However, the application of this technique is limited in pediatric cases, it has also proved to

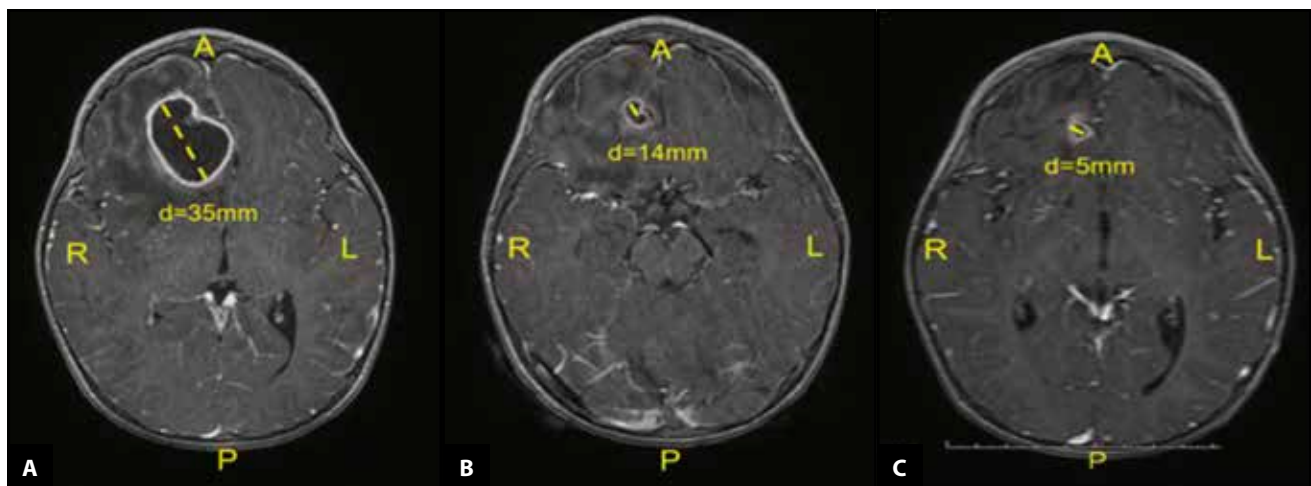


Figure 4. Representative MR images: A – preoperative, B – 7th postoperative day, C – 26th postoperative day. Significant reduction in abscess size could be observed after the operation, and further regression was detected 26 days postoperatively.

be a safe and feasible approach for the management of a variety of pediatric skull base malignancy¹³. Beside the oncological advantages of the transnasal endoscopic surgery, here we presented a possible minimal invasive solution of brain abscess evacuation in special cases. In our case, we could manage the removal of a penetrating foreign object, abscess evacuation and drainage in one step, minimally invasively, without any external approach. With this concept, intra and postoperative complications reduced significantly compared to other open approaches such as bifrontal craniotomy¹⁴, frontolateral, transfrontal, frontonasal approach¹⁵. These open techniques are more traumatic, the infection rate is higher compared to non-invasive techniques; therefore, the possibility of meningitis, frontobasal CSF fistula, damage of olfactory and optic nerves and ventricular penetration with consequent pneumocephalus is considerable, while conservative antibiotic treatment is possibly not enough to treat the infection in similar cases.

CONCLUSIONS

In this report, we present a unique case of brain abscess in a 22-month-old boy, following a transnasal injury with a foreign body. This atypical presentation underscores the importance of considering brain abscess as a potential complication in cases of head trauma, especially when symptoms such as recurrent epilepsy and purulent nasal discharge are present. The successful management of this case using a minimally invasive, transnasal, endoscopic-controlled technique is noteworthy. By employing this approach, we were able to remove the foreign object, drain the abscess, and achieve significant reduction in abscess size without the need for more traumatic external approaches. This case highlights the potential benefits of transnasal endoscopic approaches not only for pituitary pathologies and skull base tumors, but also for unique cases like brain abscess evacuation. The patient's one-year asymptomatic follow-up reinforces the effectiveness and safety of this approach, showcasing its potential as a viable option in selected pediatric cases where traditional surgical methods might pose greater risks or complications.

Financial disclosure: The authors of this article wish to provide full transparency regarding any potential financial interests or conflicts of interest related to the content presented. We affirm that no financial support or funding was received from any individuals, organizations or entities for the research, development or publication of this article. The authors declare that they have no financial relationships that could be perceived as influencing the objectivity, integrity or impartiality of the information presented within the article. The authors have not received any honoraria, consulting fees, or other financial incentives from sources that might benefit from the content discussed in this article. Furthermore, the authors have no personal financial investments or holdings in companies, industries or sectors that could be

directly impacted by the information shared in the article. We believe in the importance of maintaining the highest standards of ethical conduct and transparency in all aspects of our work. Therefore, we emphasize that the absence of financial support or conflicts of interest underscores our commitment to providing unbiased and objective information to our readers. Should any potential financial interests arise in the future that could be relevant to this article, the authors commit to promptly disclosing such information and taking appropriate actions to address any resulting conflicts of interest.

Contribution of authors: Concept/surgery – Zsolt Bella, Bela Fulop, Bere Zsofia, Peter Gal. Data processing – Lorand Imre Czimbalmos, Gabor Vass, Zoltan Rideg. Supervision – Laszlo Rovo, Pal Barzo.

Conflict of interest: There is no conflict of interest associated with the information presented in this article. The authors have no financial relationships, affiliations or connections with any individuals, organizations or entities that could potentially bias the objectivity or credibility of the content. Our sole commitment is to provide accurate and impartial information to our readers.

Author's information:

Lorand Imre Czimbalmos, MD, Department of Otorhinolaryngology and Head-Neck Surgery, University of Szeged, Szeged, Hungary. E-mail: czlori93@gmail.com. ORCID: <https://orcid.org/0000-0002-6709-166X>.

Zsofia Bere, med. Habil., Department of Otorhinolaryngology and Head-Neck Surgery, University of Szeged, Szeged, Hungary. E-mail: berezsofia@gmail.com. ORCID: <https://orcid.org/0000-0002-8342-1059>.

Zoltan Rideg, MD, Department of Neurosurgery, University of Szeged, Szeged, Hungary. E-mail: zoltan.rideg@med.u-szeged.hu. ORCID: <https://orcid.org/0000-0002-8535-518X>.

Bela Fulop, MD, PhD, Department of Neurosurgery, University of Szeged, Szeged, Hungary. E-mail: fulop.bela@med.u-szeged.hu. ORCID: <https://orcid.org/0000-0002-3753-9566>.

Pal Barzo, PhD, med. habil., Professor, Department of Neurosurgery, University of Szeged, Szeged, Hungary. E-mail: barzo.medical@gmail.com. ORCID: <https://orcid.org/0000-0002-1475-5207>.

Gabor Vass, PhD, Senior Lecturer, Department of Otorhinolaryngology and Head-Neck Surgery, University of Szeged, Szeged, Hungary. E-mail: gaborvassmd@gmail.com. ORCID: <https://orcid.org/0000-0003-0787-8679>.

Peter Gal, MD, Department of Pediatrics and Pediatric Health Care Center, University of Szeged, Szeged, Hungary. E-mail: galpeter78@gmail.com. ORCID: <https://orcid.org/0009-0001-2941-021X>.

Zsolt Bella, PhD, med. habil., Department of Otorhinolaryngology and Head-Neck Surgery, University of Szeged, Szeged, Hungary. E-mail: dr.bella.zsolt@gmail.com. ORCID: <https://orcid.org/0000-0001-5186-5598>.

REFERENCES

1. Shachor-Meyouhas Y, Bar-Joseph G, Guilburd JN, Lorber A, Hadash A, Kassis I. Brain abscess in children—epidemiology, predisposing factors and management in the modern medicine era. *Acta Paediatr.* 2010;99(8):1163-7. DOI: 10.1111/j.1651-2227.2010.01780.x.
2. Yogeve R. Focal suppurative infections of the central nervous system. In: Long SS, Pickering LK, Prober CG, editors. *Principles and practice of pediatric infectious disease.* 3rd ed. Philadelphia: Elsevier Inc; 2008, p.324-35.
3. Goodkin HP, Pomeroy SL. Parameningial infections. In: Feigin RD, Cherry J, Demmler G, Kaplan S, editors. *Textbook of pediatric infectious diseases.* 5th ed. Philadelphia: Elsevier Inc; 2003, p.475-83.
4. Yogeve R, Bar-Meir M. Management of brain abscess in children. *Pediatr Infect Dis J.* 2004;23(2):157-9. DOI: 10.1097/01.inf.0000110272.67271.a2.
5. Gillingham FJ. Neurosurgical experience in Northern Italy. *Br J Surg.* 1947;55(Suppl 1):80-7.
6. Cairns H, Calvert CA, Daniel P, Northcroft GB. Complications of head wounds with special reference to infection. *Br J Surg.* 1947;Suppl 1:198.
7. Dinaker I, Rao SB. Post-traumatic brain abscess. *J Post Grad Med.* 1971;17:137-41.
8. Bonfield CM, Sharma J, Dobson S. Pediatric intracranial abscesses. *J Infect.* 2015;71 Suppl 1:S42-6. DOI: 10.1016/j.jinf.2015.04.012.
9. Canpolat M, Ceylan O, Per H, Koc G, Tunturk A, Kumandas S, et al. Brain abscesses in children: results of 24 children from a reference center in Central Anatolia, Turkey. *J Child Neurol.* 2015;30(4):458-67. DOI: 10.1177/0883073814549247.
10. Nathoo N, Nadvi SS, Narotam PK, van Dellen JR. Brain abscess: management and outcome analysis of a computed tomography era experience with 973 patients. *World Neurosurg.* 2011;75(5-6):716-26; discussion 612-7. DOI: 10.1016/j.wneu.2010.11.043.
11. Pollock JR, Akinwunmi J, Scaravilli F, Powell MP. Transcranial surgery for pituitary tumors performed by Sir Victor Horsley. *Neurosurgery.* 2003;52(4):914-25; discussion 925-6. DOI: 10.1227/01.neu.0000053148.34310.bb.
12. Lee SC, Senior BA. Endoscopic skull base surgery. *Clin Exp Otorhinolaryngol.* 2008;1(2):53-62. DOI: 10.3342/ceo.2008.1.2.53.
13. Chivukula S, Koutourosiou M, Snyderman CH, Fernandez-Miranda JC, Gardner PA, Tyler-Kabara EC. Endoscopic endonasal skull base surgery in the pediatric population. *J Neurosurg Pediatr.* 2013;11(3):227-41. DOI: 10.3171/2012.10.PEDS12160.
14. Piek J. Surgical treatment of complex traumatic frontobasal lesions: personal experience in 74 patients. *Neurosurg Focus.* 2000;9(1):e2. DOI: 10.3171/foc.2000.9.1.2.
15. Rocchi G, Caroli E, Belli E, Salvati M, Cimatti M, Delfini R. Severe craniofacial fractures with frontobasal involvement and cerebrospinal fluid fistula: indications for surgical repair. *Surg Neurol.* 2005;63(6):559-63; discussion 563-4. DOI: 10.1016/j.surneu.2004.07.047.

© 2023 Lorand Imre Czimbalmos, Zsofia Bere, Zoltan Rideg, Bela Fulop, Gabor Vass, Peter Gal, Pal Barzo, Zsolt Bella, published by Romanian Rhinologic Society



This is an open access article published under the terms and conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>). CC BY-NC-ND 4.0 license requires that reusers give credit to the creator by citing or quoting the original work. It allows reusers to copy, share, read, download, print, redistribute the material in any medium or format, or to link to the full texts of the articles, for non-commercial purposes only. If others remix, adapt, or build upon the material, they may not distribute the modified material.