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CASE REPORT

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

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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 surgery[1]. 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 elderly[5-7] – 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 felt over, and the pencil penetrated into the nose. However, according to his mother, the pencil had been removed intact in one piece.

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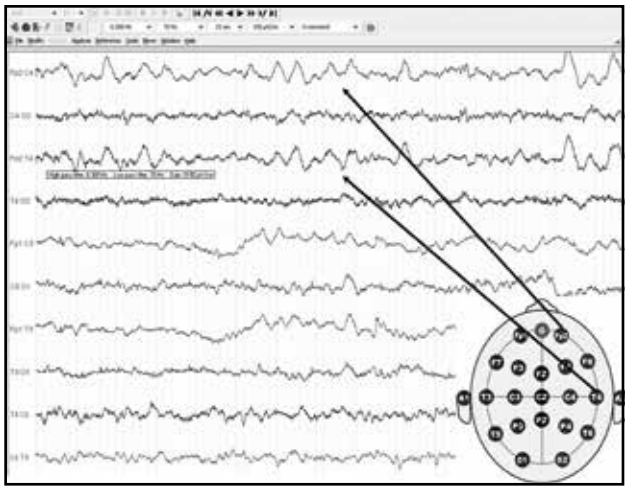

Figure 1. EEG measurement: the patient is awake, without provocation – pathological waves in the right frontotemporal/parietal leads. Arrows connect the recordings with the affected electrode sites.

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

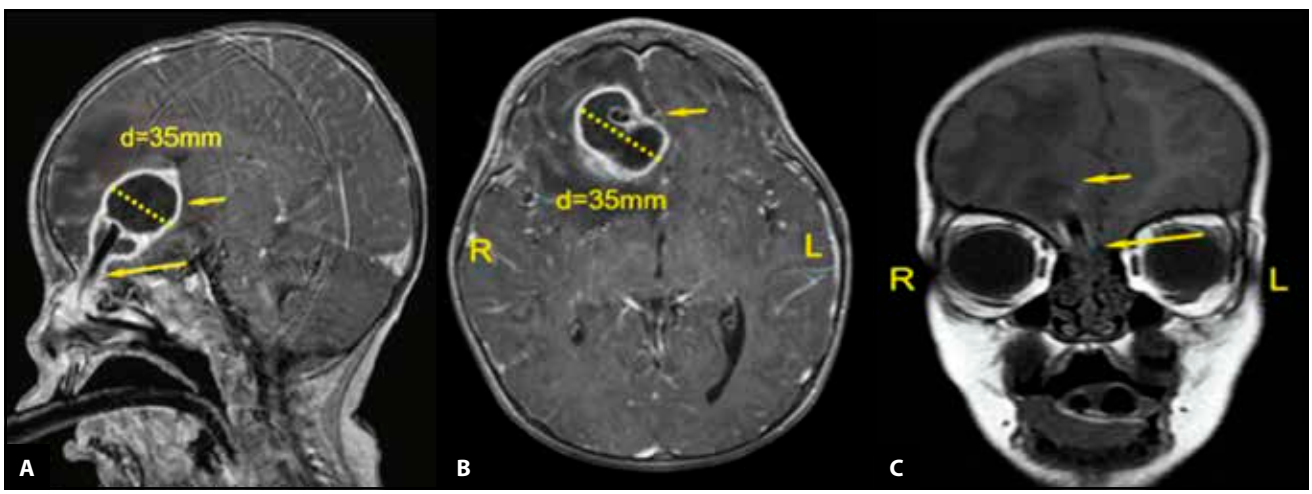

Figure 2. MRI images: **A** – sagittal, **B** – horizontal, **C** – coronal plane. Small yellow arrows on each picture point the brain abscess in the right frontal region (largest diameter = 35mm). Longer yellow arrows on images A and C show the insertion canal, originating from the left nasal cavity,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

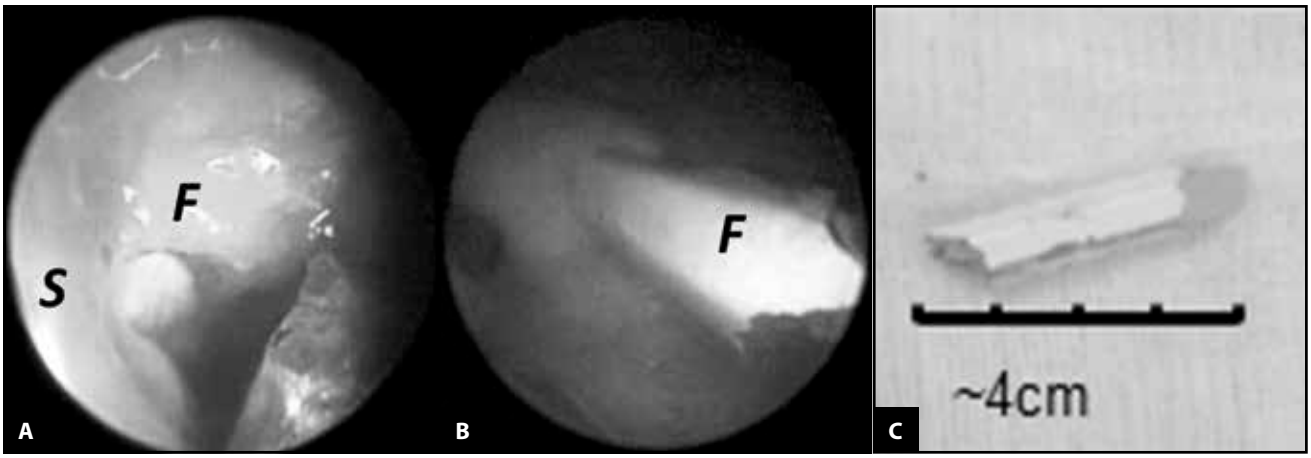

Figure 3. A, B: Intraoperative pictures with endoscopy. S: septum; F: foreign object; **C:** removed foreign object (broken part of a white pencil, ~4cm long).

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-liquorrhoea 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

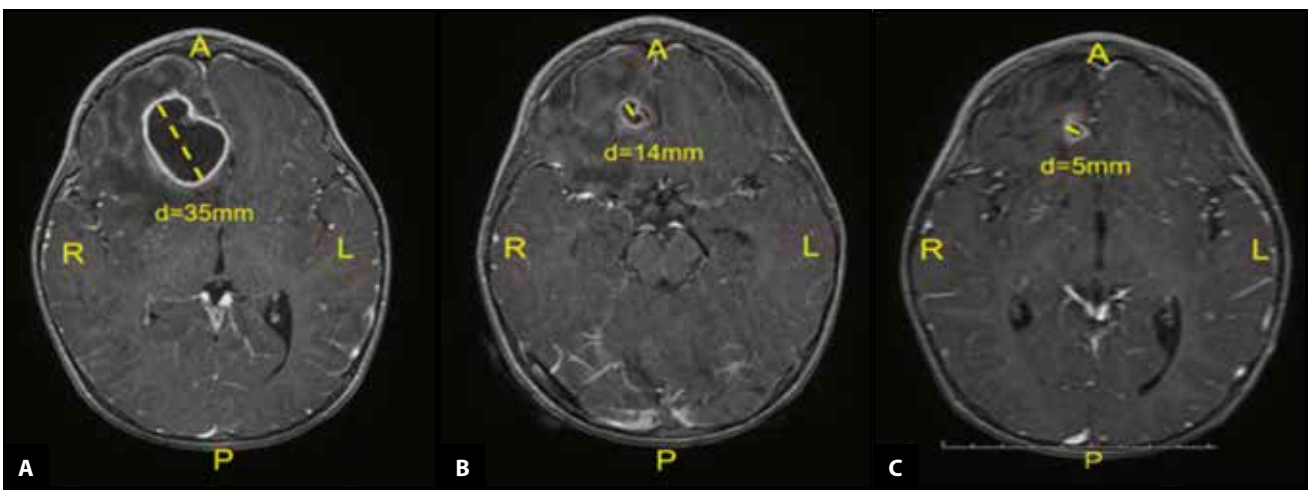

Figure 4. Representative MR images: **A** – preoperative, **B** – 7th postoperative day, **C** – 26th postoperative day. Significant reduction in abscess size could be observed after the operation, and further regression was detected 26 days postoperatively.

be a safe and feasible approach for the management of a variety of pediatric skull base malignancy[13]. Beside the oncosurgical 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 craniotomy[14], frontolateral, transfrontal, frontonasal approach[15]. 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.

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