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Letter to the Editor: New Observation

Lost and Found: A Brain Abscess and the Hidden Thumbtack

Seunghun Lee[1], Farraminah Francis[2], Sarah Almas[3], Karina Top[2], Trina Rosaasen[3] and Cameron Alistair Elliott[1]

[1]Division of Neurosurgery, Department of Surgery, University of Alberta, Edmonton, Alberta, Canada, [2]Department of Pediatrics, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada and [3]Division of Pediatric Surgery, Department of Surgery, University of Alberta, Edmonton, Alberta, Canada

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A 14-year-old male presented to the emergency department (ED) with a one-week history of frontal headache, photophobia, nausea, vomiting and 3 days of increased somnolence. There was no other mentioned past medical history except for two brief episodes of otalgia 2 months prior. The patient and family do not have recollection of any recent aspiration episodes. Initially, he was treated with a migraine protocol and discharged home. The following day, he returned to the ED with an intensifying morning headache, nausea and vomiting. He was afebrile with no respiratory symptoms or recent travel history. On exam, there were no focal neurological deficits. Vital signs revealed bradycardia (heart rate of 54) and elevated blood pressure (141/84), concerning for increased intracranial pressure. CT scan showed prominent white matter edema in the left parieto-occipital lobe with a 5 mm right midline shift (Figure 1a), which was concerning for a tumor or abscess. After neurosurgical consultation, he was given dexamethasone and transferred to a tertiary care facility for further workup and possible surgical intervention. On arrival, an MRI with gadolinium revealed a ring-enhancing lesion on the T1-weighted image (Figure 1b) with diffusion restriction on the b1000 (Figure 1c) and apparent diffusion coefficient map (Figure 1d), indicating an intracranial abscess measuring 3.3 × 3.1 × 3.4 cm in the left posterior parietal lobe. He was taken for a left parietal craniotomy with navigation for abscess drainage. Intraoperatively, deep wound and fluid cultures were collected.

Pre-operatively, investigations revealed a mildly elevated C-reactive protein and elevated white blood cells with neutrophilia. A CT head scan did not identify a source of local spread, and a dental exam revealed only mild chronic gingivitis. Further investigations included a cardiac echocardiogram, which incidentally showed a significant atrial septum defect secundum (ASD) with left-to-right shunting. On an initial chest X-ray ordered to confirm the placement of the endotracheal tube, there was no mention of a foreign body on the radiographic interpretation, but retrospectively it was missed (Figure 1e). A second X-ray was performed six hours later to follow up on suspected aspiration pneumonia based on previously seen opacities. The radiologist's impression did make note of a metallic object that may be external or aspirated foreign body. It was not until three days later that lateral fluoroscopy for peripherally inserted central catheter line insertion redemonstrated a metallic foreign body in the right main bronchus, prompting removal via bronchoscopy (Figure 1f). The thumbtack is embedded in the bronchus with surrounding tissue growth and discoloration, indicating the thumbtack to be chronic (Figure 1f). Although no purulent discharge was observed, the surrounding tissue appears swollen, potentially demonstrating an inflammatory/infectious process.

Initial reports of gram-positive cocci and gram-positive bacilli in preliminary cultures, resembling anaerobic non-spore-forming bacilli, prompted the initiation of antimicrobial treatment with vancomycin 1500 mg IV Q6 hrs, metronidazole 500 mg IV Q6 hours and ceftriaxone 2 g Q12 hrs for broad coverage, including methicillin-resistant *Staphylococcus aureus* and anaerobes. The cultures grew *Aggregatibacter aphrophilus* and anaerobes, including *Actinomyces meyeri*, *Fusobacterium nucleatum*, *Parvimonas micra* and *Eikenella corrodens* (Table 1). Based on final susceptibilities, vancomycin was discontinued, and ceftriaxone IV and oral metronidazole were continued for 10 weeks.

Prior to the discovery of the thumbtack in the right mainstem bronchus, we suspected the abscess was secondary to a periodontal infection. *Aggregatibacter aphrophilus* has been associated with periodontal infections and soft tissue abscesses.[1] *Eikenella corrodens* is a facultative gram-negative bacillus that is a commensal of the oral cavity, residing in dental plaques. On rare occasions, it causes extraoral infections.[1] *Fusobacterium nucleatum* is an opportunistic gram-negative anaerobe that is a commensal of both the oral flora and the gastrointestinal tract.[2] Similarly, *Parvimonas micra* is commonly associated with *Fusobacterium* and is a gram-positive, obligate anaerobic coccus that colonizes the gastrointestinal tract and is often linked to periodontitis.[3] *Actinomyces meyeri* is a gram-positive anaerobic bacillus implicated in brain abscesses and chronic granulomatous infections.[4] However, the abscess was in the left posterior parietal region, making contiguous spread from the sinuses, middle ear or an odontogenic source unlikely.

Given the discovery of the foreign body embedded in the right mainstem bronchus and the growth of multiple organisms known

Corresponding author: Cameron Alistair Elliott; Email: celliott@ualberta.ca

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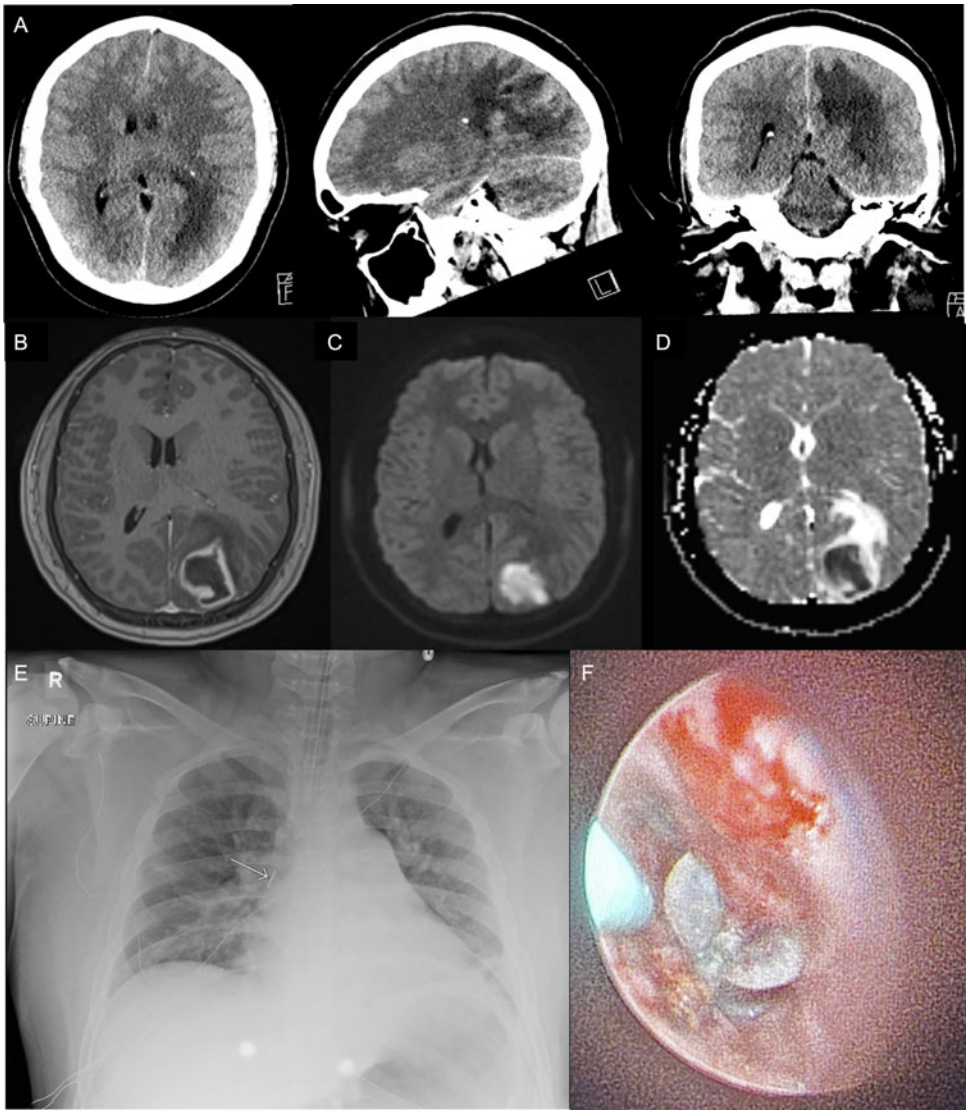

Figure 1. A) Initial non-contrast enhanced CT imaging on the patient's second presentation to a community hospital. Focal heterogeneous white matter edema is demonstrated in the left parietal occipital lobe with a 5 mm midline shift. Initial conclusion was possible malignancy, preferably a primary brain tumor. B) MRI with hypointense T1 ring-enhancing post gadolinium lesion in the left posterior parietal lobe measuring 3.3 x 3.1 x 3.4 cm. C) Diffusion-weighted imaging b1000 and D) ADC map demonstrating restricted diffusion with extensive surrounding vasogenic edema suggestive of a brain abscess. E) Foreign body initially seen on chest radiograph, suggesting metallic objects in the right main bronchus. F) Bronchoscopy visualization and retrieval of the foreign body, which was an embedded thumbtack. There is tissue growth and discoloration surrounding the thumbtack, which may indicate a chronic inflammatory or infectious process.

Table 1. Susceptibility table of organisms cultured from the brain aspirate

	Aggregatibacter aphrophilus	Actinomyces meyeri	Eikenella corrodens	Fusobacterium nucleatum	Parvimonas micra
Ampicillin	Susceptible		Susceptible[1]		
Cefotaxime			Susceptible[1]		
Ceftriaxone	Susceptible	Susceptible[1]	Susceptible[1]		
Meropenem		Susceptible		Susceptible	Susceptible
Metronidazole		**Resistant**		Susceptible	Susceptible
Penicillin		Susceptible		Susceptible	Susceptible

[1]Susceptibility was assessed using a non-reference method, with results considered probable but not definitive.

to colonize the oral cavity and upper airway, we speculate that the most likely source for the brain abscess was the chronic presence of a foreign body in the airway, possibly years since the patient had no recollection of any aspiration event. We suspect that the presence of chronic infection and inflammation around the embedded thumbtack colonized with oral flora, possibly seeded from his gingivitis, likely led to transient bacteremia and hematogenous spread to the brain. Previous studies have shown that chronic lung disease predisposes patients to brain abscesses.[5] The adjusted odds ratio of developing a brain abscess in adults with lung abscess or bronchiectasis may be as high as 8.15 (95% CI 3.59–18.5).[6]

Previous case reports have found airway foreign bodies in relation to intracranial abscess. Similarly to our patient, one case reports *Actinomyces meyeri* cultured from a thumbtack in a 10-

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year-old patient with an intracranial abscess presenting with neurological symptoms and *Eikenella corrodens* from the intracranial abscess in a 2-year-old child who aspirated on a straight pin.[7,8]

Our case study highlights the importance of a thorough investigation to elucidate the underlying etiology of brain abscesses, particularly in pediatric patients who often have nonspecific symptoms or an atypical clinical presentation. Although we did not culture the thumbtack in this case study, other reports of patients with sharp airway foreign bodies had similar organisms grow in the microbial cultures. The pathophysiology from an embedded thumbtack leading to a brain abscess may be initiated by chronic inflammation and "lung disease mimics," causing hematogenous spread of endogenous pathogens. As such, the need for thorough investigations to identify possible sources of infection is important in patients with an intracranial abscess.

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