

# Cerebral Abscess of Odontogenic Origin: A Case Report and Review of Literature

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## ABSTRACT

**Objective:** Cerebral abscess of odontogenic origin is uncommon and could be associated with life threatening complications if not diagnosed and treated early. Diagnosis could be challenging therefore, detailed history of early toothache and facial swelling in addition to central nervous system (CNS) signs could be a pointer to an odontogenic cause. We report a case of cerebral abscess resulting from pericoronitis of impacted left maxillary third molar in an 18-year male with positive history of substance abuse.

**Case description:** An unconscious 18-year-old male adolescent with a history of toothache, facial swelling, fever, vomiting, seizures presented in our accident and emergency. Clinical and radiological examination revealed an impacted left maxillary third molar tooth, sinusitis and cerebral abscess. Patient succumbed to the disease during intracranial drainage and removal of offending tooth.

**Conclusion:** Oral examination is a very important step whenever cerebral abscess is suspected or diagnosed. Removal of the primary odontogenic cause should be an integral part of the overall management in a multidisciplinary setting like ours.

**Keywords:** Cerebral abscess, Pericoronitis, Maxillary third molar, diagnostic challenge

## INTRODUCTION:

Cerebral abscesses are rare but serious, life-threatening infections of brain tissue with localized zone of suppuration. They may result following cranial trauma or surgery or secondary infection with septic focus elsewhere which could spread either to contiguous tissue or through the bloodstream. Brain abscesses arising from paranasal sinuses, middle ear and dental infection have been reported to account for 25–50% of the cases (Miranda et al., 2013). Odontogenic infections may arise from pulp necrosis, periodontal disease, trauma, pericoronitis, apical lesions or complications of certain dental procedures (Flynn et al., 2006; Corson et al., 2001). Non-odontogenic infections may be due to fractures, sialoadenitis, tumor or cystic lesion, pharyngitis or tonsillitis (Miranda et al., 2013, Guzmán-Letelier et al., 2017). The spread of an infection depends on the interplay between the patient or host condition and microbial factors (Jaunay et al., 2000). Systemic conditions such as HIV/AIDS disease, uncontrolled diabetes mellitus, immunosuppression, alcoholism and use of recreational drugs have been reported to favour spread of infection (Flynn et al., 1999). Availability of

more effective antibiotics, advanced imaging techniques, such as computed tomography (CT), and magnetic resonance imaging (MRI), and improved surgical techniques have played a major role in reducing the mortality rate. (Wu et al., 2014). The treatment is mainly by surgical drainage via a craniotomy, copious irrigation, removal of necrotic tissues, the removal of the causal tooth and appropriate antibiotic therapy. (Choudhury et al., 2020).

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It is therefore pertinent that attending physicians and dental surgeons recognize early signs of cerebral abscess, ensure immediate referral or treatment since prompt intervention is a critical determinant of patient survival and reduction of fatal complications. We report a case of cerebral abscess resulting from pericoronitis of impacted left maxillary third molar in an 18-year male with positive history of substance abuse which could have been missed.

## CASE REPORT

An unconscious 18-year-old male patient was referred from a private facility to the accident and emergency unit of our hospital. Information from relatives revealed a 2-week history of toothache from the left maxillary quadrant with subsequent left facial swelling extending to the eyelids, severe headache of 1-week duration and altered mental state after episodes of vomiting and seizures of three-days duration. He indulged in the use recreational drugs including marijuana.

Patient was febrile, pale, anicteric, acyanosed, dehydrated in obvious respiratory distress and with a big tattoo on the left arm. There was diffused facial swelling with periorbital ecchymosis bilaterally. The Glasgow Coma Scale was 8/15 (E2V2M4), Kernigs and Brudenski's signs were negative (no neck stiffness), right pupil was 1.5mm, left pupil was 3 mm both were unreactive. Vital signs at presentation were; pulse rate-96 beats/min (strong and regular), temperature-40 degree Celsius, blood pressure-138/80mmHg, Respiratory rate-56

cycles/minute and oxygen saturation-70%. Initial intraoral examination could not be comprehensively carried out owing to marked trismus and patient dependency on oxygen via facemask until endotracheal intubation was instituted for surgical intervention. Oral findings included erythema of the soft tissue covering the left maxillary third molar, therefore an assessment of cerebral abscess secondary to pericoronitis of left maxillary 3rd molar was made.

Computed Tomography (CT) scan showed impacted left maxillary third molar with isodensity of left maxillary and ethmoidal sinuses (Figure 1a & b). The brain showed area of hypodensity in the cavo-convex left fronto-temporo-parietal area, non-contrast enhancing with maximum thickness of about 0.83cm resulting in significant contralateral midline shift of about 1.08cm, with effacement of the ipsilateral lateral ventricle. There was mild dilatation of the anterolateral lateral ventricle and global effacement of the cortical sulci and basal cisterni with crowded foramen magnus (Figure 2).

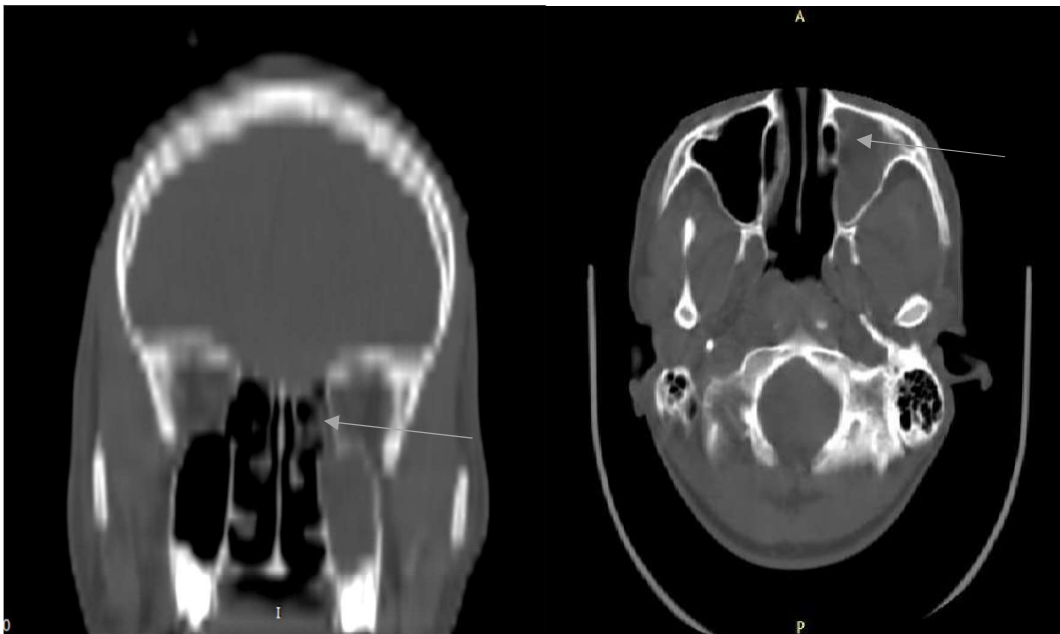


Figure 1a & b: CT scan showing impacted left maxillary third molar with isodensity of left maxillary and ethmoidal sinuses (white arrows)

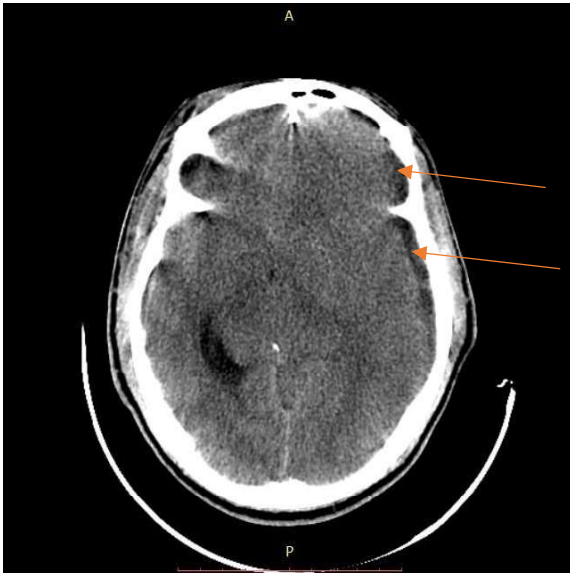


Figure 2: CT axial view showing hypodensity in the left fronto-temporo-parietal region (red arrows)

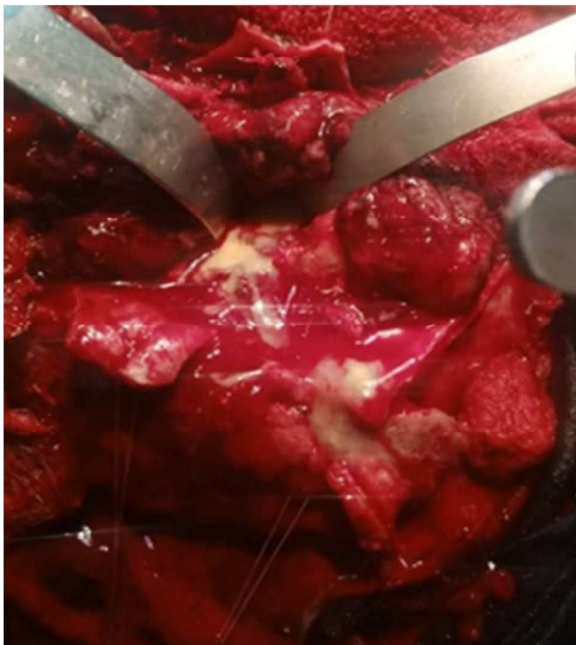


Figure 3: Craniotomy and evacuation of pus

Urinalysis revealed high bilirubin level, hematuria and proteinuria. Haematological parameters showed an increased WBC count of 22,200/mcL, with the granulocytes accounting for 91.1% and ESR 69mm/hour. Retroviral screen was non-reactive and no malaria parasites seen.

Patient was jointly managed by the neurosurgeons and the oral and maxillofacial surgeons. He was immediately placed on IV Rocephin® 2g 12-hourly, IV metronidazole infusion 500mg 8-hourly, 20% mannitol in 300 ml given over 30 minutes then 150 ml 4 hourly over 10-15 minutes, IV frusemide 20 mg given after each dose of mannitol, IV dexamethasone 8 mg 8 hourly for 24 hours and IV vancomycin 1g 12 hourly. Emergency burr hole drainage of the abscess was done (Figure 3) and the offending impacted maxillary left third molar was extracted. The

patient however stopped breathing shortly thereafter and all attempt at resuscitation failed.

#### DISCUSSION

Brain abscesses though rare are still an important cause of mortality and morbidity despite the improvement in diagnosis and treatment modalities in recent decades. (Ben Hadj Hassine et al., 2015). They could originate from a contiguous focus of infection, especially from the middle ear, mastoid cells, paranasal sinuses or from odontogenic origin and often life threatening (Antunes et al., 2011; Udoh et al., 2016). Otogenic source is the most implicated aetiology of brain abscess in several studies (Yang, 1981). Oral microorganism can get to the brain through either haematogenous (facial, angular,

ophthalmic arteries or spread from cavernous sinus), lymphatics or through direct spread. (Mylonas et al., 2007). In our case, the spread is believed to be by contiguous route from pericoronitis of the impacted maxillary left third molar to the maxillary and ethmoidal sinuses and therefore via haematogenous spread to the CNS.

The incidence rate of brain abscess reported in Denmark over a period of 1982 and 1988 increased from 0.60 per 100,000 person-years to 0.90 per 100,000 person-years between 2010 and 2016 (Bodilsen et al., 2020). However, 8% of overall intracranial abscess in developing countries and 1-2% in the western countries experienced a decline in mortality rate from about 50% to 20%, with the aid of CT scanning that help in earlier diagnosis and accurate localization (Miranda et al., 2013). The total mortality rate from brain abscess could be as high as 30%, while mortality from brain abscess of odontogenic origin alone was 8.3% (Maraby-salgado et al., 2018).

Temporal lobe is reported as the commonest site of cerebral abscess accounting for more than 40% (Yang, 1981), while another study reported frontal region as the commonest site for intracranial abscess generally (Udoh et al., 2016). Our case showed the involvement of fronto-temporo-parietal area.

Also, significant correlation has been established between leukocytosis (of above 20,000/mcL) and poor outcome, while high grade fever(>38.5°C) has also been associated with high mortality ( Ben Hadj Hassine et al., 2015). Both of these holds true for our patient as the white blood cells count was 22,000/mcL while the temperature was 40 degrees Celsius.

This patient had history of use of recreational drugs and substance abuse which have been shown to be markedly immunomodulatory and increase susceptibility to infection (Friedman et al., 2003, Friedman et al., 2006, Eisenstein et al., 2020). Also, he had a big tattoo on the left arm. It has been shown that many tattoos are related to specific kind of drug abuse and that some of them have standard locations. They also noted that certain images have close relationships with specific drugs and the ways in which they are used (Borokhov et al., 2006). However, the unconscious state of the patient did not allow us to ascertain the link between the two in this patient.

Young patients of less than 20 years of age present more with intracranial abscess with higher predilection for male (Kanu et al., 2011, Udoh et al., 2016). This was also the case for our patient as he was 18 years old.

Patients with intracranial abscess mostly present with symptoms of raised intracranial pressure (headache, nausea/vomiting, and altered level of consciousness), focal neurologic deficits, and fever. Headaches, fever, and nuchal rigidity were reported to be the commonest clinical presentation (Miranda et al., 2013). Our patient similarly presented with high grade fever, history of vomiting, loss of consciousness, possibility of neurologic deficits but no nuchal rigidity.

In the last two decades, there has been an advancement in the treatment of abscesses in general, which is based

on the excision of the causal factor (odontogenic focus), surgical drainage, and adjuvant antibiotic. This was the treatment modality adopted in our case as the patient had burr hole (craniotomy) drainage of the cerebral abscess with copious irrigation of the site locally in addition to the intravenous antibiotics which began preoperatively. They also observed that early intervention produces better outcome as those in advanced stages are commonly linked with the lethal outcome (Antunes et al., 2011). Our case corroborated this finding as it was obvious that he presented late with three-day history of altered level of consciousness. Therefore, despite appropriate treatment being instituted, the patient succumbed to the illness.

## CONCLUSION

Cerebral abscess is a life-threatening condition that should be treated as an emergency. Though, odontogenic causes are rare but should be suspected and comprehensively investigated whenever there is a history of fever, oral or perioral infections, headaches, nausea and vomiting, altered level of consciousness, seizures and neurologic deficits. Drainage of the abscess under antibiotic cover with the removal of the causal factor remains the mainstay of treatment. Multidisciplinary approach to care is advocated to reduce morbidity and fatality of brain abscesses in our environment.

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