Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Cerebral abscess caused by odontogenic infection: a case report and literature review

Sarra Azzez

azzezsarra123@gmail.com

Taher Sfar University Hospital

Afef Slim

University Clinic of Dental Medicine

Abdellatif Chokri

University Clinic of Dental Medicine

Karim Chebbi

University Clinic of Dental Medicine

Hajer Hentati

University Clinic of Dental Medicine

Case Report

Keywords: brain abscess, odontogenic infection, dental focus, maxillary osteitis, case report

Posted Date: August 13th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10343491/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Brain abscesses of odontogenic origin are rare but potentially life-threatening and require urgent multidisciplinary management. Maxillary osteitis of dental origin is an especially uncommon etiology.

Case presentation:

We report a 45-year-old Tunisian man with severe right-sided maxillary pain and progressive headache who was found to have a right temporal brain abscess secondary to maxillary osteitis following extraction of mobile maxillary molars. He underwent dental extractions and debridement, intravenous antibiotics, neurosurgical drainage via parietal burr-hole trepanation, and later prosthetic closure of a persistent oroantral communication. Bacteriology identified Staphylococcus aureus. Clinical and radiological follow-up at 1 and 3 months showed favorable evolution.

Conclusion

This case highlights that persistent cranial pain and altered consciousness after dental infection should prompt urgent neuroimaging. Early eradication of the dental focus and coordinated dental–neurosurgical care are essential to reduce morbidity and mortality.

Introduction

Brain abscess is a focal, suppurative infection of the brain parenchyma with an incidence of approximately 0.4–0.9 per 100,000 individuals and substantial morbidity and mortality despite advances in neuroimaging and therapy [1]. Odontogenic infections are an infrequent but recognized source, implicated in roughly 2–5% of brain abscesses [1, 2, 3].

Timely recognition and eradication of oral infectious foci are essential to prevent severe systemic spread and to optimize patient outcomes [4, 5]. This underscores the importance of maintaining good oral hygiene and promoting close interdisciplinary collaboration among dental surgeons, neurologists, radiologists, and neurosurgeons.

Maxillary osteitis of dental origin leading to intracranial abscess is especially rare. We present a 45-year-old immunocompetent man who developed a right temporal brain abscess secondary to maxillary osteitis following extraction of mobile maxillary molars. This case highlights the need for urgent neuroimaging when severe cranial pain and altered consciousness persist after dental infection, and it underscores the importance of early eradication of the dental focus and coordinated dental–neurosurgical care.

Case presentation

A 45-year-old Tunisian man with no significant medical history was referred to the Department of Oral Medicine and Oral Surgery at the University Dental Clinic of Monastir for extraction of a painful, mobile maxillary right second molar (tooth 17). During history, he reported severe right-sided maxillary pain associated with intense ipsilateral headaches that had progressively worsened over the preceding month.

Extraoral inspection and palpation revealed no facial swelling, lymphadenopathy, or other abnormalities. Intraoral examination revealed poor oral hygiene with generalized calculus deposits. Bilateral posterior mandibular edentulism was noted distal to teeth 35 and 45. A fixed prosthetic bridge replacing tooth 11 and supported by teeth 12 and 21 was present. Teeth 16 and 17 exhibited terminal mobility.

Panoramic radiography showed an impacted maxillary right third molar (tooth 18) (Fig. 1). On the basis of these clinical and radiographic findings, emergency extraction of teeth 16 and 17 was indicated, together with debridement and sanitation of the oral cavity.

The extraction of teeth 16 and 17 was complicated by the expulsion of a necrotic bone sequestrum accompanied by the discharge of foul-smelling purulent material. A large oroantral communication was identified, directly exposing the impacted tooth 18 (Fig. 2). In view of the extent of the defect, extraction of tooth 18 was deferred to avoid further enlargement of the communication.

An urgent computed tomography (CT) scan of the maxillofacial region was ordered, and the bone sequestrum was submitted for histopathological examination. The surgical site was irrigated with povidone-iodine solution, and empirical antibiotic therapy was initiated with amoxicillin (3 g/day) and metronidazole (1.5 g/day) for 10 days. CT imaging revealed complete opacification of the right maxillary sinus, an osteolytic aspect of the medial sinus wall, and thickening of the right masticatory space (Fig. 3). Histopathological analysis of the sequestrum confirmed chronic osteitis.

Tooth 18 was subsequently extracted under local anesthesia (Fig. 4). Owing to extensive tissue destruction and the large oroantral communication, closure using either a vestibular advancement flap or a buccal fat pad flap was deemed unfeasible. Meticulous surgical debridement of the site was performed, and the wound margins were approximated as closely as possible. Two platelet-rich fibrin membranes were placed to promote healing (Fig. 5).

Despite appropriate local management, the patient continued to experience severe radiating cranial pain and developed new-onset altered consciousness. In light of these worsening neurological symptoms, the differential diagnosis included intracranial neoplasm, cerebral venous sinus thrombosis, and other causes of infectious encephalopathy.

He was therefore urgently referred to the Neurology Department for further evaluation. Brain CT imaging demonstrated a hypodense lesion in the right temporal region, measuring 27 × 40 mm, highly suggestive

of cerebral infection (Fig. 6). A final diagnosis of right temporal brain abscess secondary to maxillary osteitis of odontogenic origin was established.

The patient was hospitalized and underwent neurosurgical drainage via parietal burr-hole trepanation, followed by intravenous antibiotic therapy. Bacteriological examination of the abscess material identified *Staphylococcus aureus*. Clinical and radiological follow-up at 1 and 3 months revealed favorable evolution, with marked reduction in the size of the cerebral abscess (Fig. 7).

The patient was subsequently referred to the Department of Prosthodontics for the fabrication of a prosthetic obturator to close the residual oroantral communication (Fig. 8). The prosthetic workflow included primary alginate impressions, functional impressions, base plate fabrication, tooth arrangement, and delivery of the definitive obturator prosthesis.

Timeline:

Month 0: Onset of severe right maxillary pain and ipsilateral headache.

Week 4: Referral for extraction of teeth 16 and 17; necrotic sequestrum and oroantral communication identified; antibiotics initiated.

Week 4: Extraction of tooth 18; persistent cranial pain and new altered consciousness.

Week 5: Brain CT shows right temporal abscess; neurosurgical drainage and IV antibiotics.

Month 1 and 3: Clinical and radiological improvement; prosthetic obturator delivered.

Patient perspective

The patient reported that the severity and persistence of his headaches were unexpected for a dental problem. He emphasized the importance of being informed about possible systemic complications of dental infections and expressed satisfaction with the coordinated care between dental and neurosurgical teams.

Discussion

A brain abscess is defined as a localized collection of pus within the brain parenchyma [6]. It is relatively uncommon, with a reported global incidence ranging from 0.4 to 0.9 cases per 100,000 individuals, and can occur at any age, although the highest frequency is observed between the third and fifth decades of life. Brain abscesses predominantly affect males younger than 60 years [7, 8], which is consistent with the age and sex of our 45-year-old male patient. Despite significant advances in neuroimaging, surgical techniques, and antimicrobial therapy, brain abscesses remain serious infections associated with substantial morbidity and mortality. Reported mortality rates range from 10% to 37% for brain abscesses

overall [3, 8], whereas odontogenic brain abscesses have mortality rates between 0% and 24% [9], underscoring the importance of early diagnosis and prompt, appropriate management.

The clinical presentation of intracranial abscesses is highly variable and often nonspecific, depending on the source of infection, pathogen virulence, lesion size and location, number of abscesses, involved brain structures, and the patient's immune status [10]. Common symptoms include headache, fever, nausea, vomiting, impaired consciousness, focal neurological deficits, seizures, and signs of increased intracranial pressure [10, 11]. However, the classic triad of fever, headache, and focal neurological deficits is observed in only a minority of patients [11]. In our case, the patient presented primarily with severe headache and later developed altered consciousness, illustrating the often atypical and insidious presentation of odontogenic brain abscesses.

Odontogenic infections may spread to the cranial cavity through several pathways, including hematogenous dissemination via bacteremia, direct venous drainage through the facial and pterygoid venous plexuses toward the cavernous sinus, contiguous extension through adjacent anatomical structures, and lymphatic spread. Among these mechanisms, hematogenous dissemination is frequently considered the predominant route in dental-origin intracranial infections, as brain abscesses may occur irrespective of whether the odontogenic focus is maxillary or mandibular and can occasionally develop contralateral to the primary oral lesion. However, the localization of brain abscesses often reflects the source and route of spread of the infection. Temporal lobe and cerebellar abscesses are classically associated with otogenic infections, whereas odontogenic and sinonasal infections more commonly involve the frontal lobe [12].

In most reported odontogenic cases, cerebral abscesses are located ipsilateral to the oral infectious focus, supporting the role of contiguous spread, as observed in our patient. Maxillary osteitis and extensive maxillary sinus involvement led to a right temporal lobe abscess, consistent with a direct extension pathway. CT imaging confirmed complete opacification of the right maxillary sinus and osteolysis of the medial sinus wall, suggesting that the infection progressed from the maxillary molars into the masticatory space and then intracranially. Notably, the temporal lobe is reported as the most common site of brain abscess, accounting for approximately 42% of cases [13].

Patients with immunocompromising conditions such as HIV infection, chronic alcohol abuse, diabetes mellitus, chemotherapy, or malignancy are at increased risk of developing brain abscesses. Nevertheless, several cases have been described in previously healthy, immunocompetent individuals, particularly in association with poor oral hygiene or following dental procedures [14]. This is in accordance with our case, in which the patient had no significant systemic comorbidities but exhibited poor oral health and untreated dental disease.

Streptococci, especially members of the Streptococcus intermedius group such as *Streptococcus anginosus*, are the most frequently isolated pathogens in brain abscesses. Approximately 40% of cases are polymicrobial, particularly when the portal of entry is the oropharynx, typically involving streptococci combined with anaerobic bacteria. Depending on the entry site, other microorganisms may also be

identified, including enterobacteria, *Pseudomonas aeruginosa*, and *Staphylococcus aureus.* In odontogenic brain abscesses, streptococci are isolated in nearly 70% of cases [15]. In our patient, bacteriological examination of the abscess aspirate revealed *Staphylococcus aureus.* While the *Streptococcus anginosus* group and anaerobes are the most frequent isolates in odontogenic brain abscesses, *S. aureus* is reported in approximately 12–15% of cases [16], which is consistent with our microbiological findings.

The association between brain abscesses and oral infection is considered uncommon, yet a dental origin should always be systematically investigated. One series described seven cases of intracranial abscesses and empyemas caused by odontogenic pathogens, in which bacteriological examination identified oral commensal streptococci in six patients (85.7%) and *Porphyromonas gingivalis*, a periodontal pathogen, in one patient. All patients displayed poor oral health, including dental caries and missing teeth, and no other infectious focus was identified. This series emphasizes the need for thorough oral examination in cases of intracranial infection and eradication of all potential dental foci [17].

To help establish the odontogenic origin of a brain abscess, Ewald et al. proposed three diagnostic criteria: absence of any alternative source of bacteremia, identification of microorganisms typical of the oral microbiota in microbiological cultures, and clinical or radiographic evidence of active dental or periodontal infection [18]. Reported odontogenic causes of brain abscesses include dental abscesses, cellulitis, periodontitis, osteitis, dental extractions, and endodontic treatments [3]. In this context, our case illustrates how maxillary osteitis of dental origin can progress to a brain abscess. Untreated dental infections may extend through surrounding tissues and gain access to different dissemination pathways, allowing bacteria to reach the brain and culminating in a cerebral abscess, a severe and potentially fatal complication requiring urgent medical intervention.

Magnetic resonance imaging (MRI) is considered the imaging modality of choice for diagnosing brain abscesses because of its superior sensitivity and specificity compared with computed tomography (CT) [11]. MRI enables early detection of cerebritis, improved visualization of ventricular or subarachnoid spread, and identification of satellite lesions. When MRI is unavailable or contraindicated, contrast-enhanced CT remains a valuable alternative, facilitating accurate localization, characterization, and staging of abscesses, as well as assessment of their number and size. Typical radiological findings on CT or MRI include a hypodense lesion surrounded by a contrast-enhancing ring [19]. In our patient, CT imaging was sufficient to identify the right temporal abscess and to guide neurosurgical management.

The treatment of brain abscesses generally relies on a combined medical and surgical approach, together with the management of the primary infectious focus [12]. Surgical options include drainage, complete excision, or stereotactic aspiration of the abscess, whereas antimicrobial therapy may be administered intravenously, orally, or intrathecally, depending on the clinical scenario [20]. In odontogenic brain abscesses, two main therapeutic goals must be pursued: elimination of the primary dental focus (infected teeth and associated osteitis) and appropriate management of the intracranial lesion. For

abscesses larger than 1 cm in diameter, as in our case (27 mm), neurosurgical drainage by aspiration or excision is generally indicated in combination with systemic antimicrobial therapy. Stereotactic-guided aspiration is frequently used and allows both decompression and microbiological sampling. Following drainage, long-term parenteral antibiotics are typically administered for 4 to–weeks [12].

Empirical broad-spectrum antimicrobial therapy targeting both aerobic and anaerobic microorganisms should be initiated promptly in all patients with suspected brain abscess. The choice of antibiotics depends on several factors, including pharmacokinetic and pharmacodynamic properties, prior antibiotic exposure, route of administration, patient-related risk factors, presumed pathophysiological mechanism of abscess formation, and identified or suspected pathogens [21]. In our case, early empirical therapy was started and then adapted according to microbiological findings. Prevention of brain abscesses relies on the identification and eradication of infectious foci, particularly those of dental origin [12]. Even an asymptomatic devitalized tooth may lead to transient bacteremia and hematogenous spread. The appearance of unusual neurological signs and symptoms in patients with poor oral health or recent dental procedures should raise suspicion for a possible brain abscess. Once the diagnosis is established, systematic investigation of the primary infectious source is mandatory, and identification of an odontogenic focus is crucial for both diagnostic confirmation and therapeutic planning.

The favorable outcome in this case was achieved through a multidisciplinary approach involving oral surgery, neurology, neurosurgery, and prosthodontics. The coordinated elimination of the dental source, neurosurgical drainage of the abscess, prolonged targeted antibiotic therapy, and definitive rehabilitation of the oroantral communication with a prosthetic obturator collectively contributed to the patient's recovery and reduction in abscess size on follow-up imaging.

Limitations

This report is limited by the absence of MRI, which could have better delineated the extent of intracranial involvement and detected satellite lesions, and by the lack of molecular typing to confirm strain concordance between the oral and intracranial isolates. Additionally, long-term neurocognitive outcomes were not formally assessed.

Lesson learned

Persistent or worsening cranial pain and any change in consciousness following dental infection or surgery should prompt urgent neuroimaging. Early elimination of the dental focus and close collaboration between dental, medical, and neurosurgical teams are critical to prevent fatal outcomes.

Conclusion

Odontogenic infections, although uncommon, can lead to life-threatening intracranial complications. Persistent cranial pain or neurological deterioration in patients with dental infection should prompt

urgent neuroimaging, and successful management requires rapid elimination of the oral source together with coordinated multidisciplinary care.

Abbreviations

CT computed tomography

HIV Human Immunodeficiency Virus

MRI Magnetic resonance imaging

Declarations

Ethics and consent to participate

Written consent from patient is available upon request

Consent to publish

Written informed consent for publication of this case and the accompanying images was obtained from the patient. A copy of the consent form will be made available for review by the Editor-in-Chief of this journal on request

Availability of data and materials

Not applicable

Competing interests

The authors declare that there are no competing interests.

Funding

Not applicable.

Author contributions

SA, AS and AC: patient management, data collection, and drafting the manuscript.

KC: contributed substantially to patient management and revision of the manuscript.

HH: supervision

All authors read and approved the final version of the manuscript.

Acknowledgments

Not applicable.

References

1. -Burgos-Larraín LF, Vázquez-Portela Á, Cobo-Vázquez CM, Sáez-Alcaide LM, Sánchez-Labrador L, Meniz-García C. Brain complications from odontogenic infections: A systematic review. J Stomatol Oral Maxillofac Surg. 2022;123(6):e794-e800.
2. -Rae Yoo J, Taek Heo S, Kim M, et al. *Porphyromonas gingivalis* causing brain abscess in patient with recurrent periodontitis. Anaerobe. 2016; 39:165–7.
3. -Abed K, Paciorek M, Bursa D. Potential infection foci in the oral cavity and their impact on the formation of central nervous system abscesses: A literature review. Medicine 2023; 102:46(e35898).
4. -S. Y. Yang, “Brain abscess: a review of 400 cases,” Journal of Neurosurgery, vol. 55, no. 5, pp. 794–799, 1981.
5. -P. Tattevin, F. Bruneel, B. Clair et al., “Bacterial brain abscesses: a retrospective study of 94 patients admitted to an intensive care unit (1980 to 1999),” The American Journal of Medicine, vol. 115, no. 2, pp. 143–146, 2003.
6. -Wei J, Zhong F, Sun L, Huang C-Y. Brain abscess of odontogenic origin: A case report and literature review. Medicine 2023;102:48
7. -Shibata T, Hashimoto N, Okura A, et al. Brain abscess of odontogenic origin in patients with malignant tumors: a report of two cases. Surg Neurol Int. 2021;12:417
8. -Pereira AJDSPR, Tavares AT, Prates M, et al. Brain abscess: a rare clinical case with oral etiology. Case Rep Infect Dis. 2022;2022:e5140259
9. -Van der Cruyssen F, Grisar K, Maes H, et al. Case of a cerebral abscess caused by *Porphyromonas gingivalis* in a subject with periodontitis. BMJ Case Rep. 2017;2017:1–5.
10. -Nathoo N, Nadvi SS, Narotam PK, et al. Brain abscess: Management and outcome analysis of a computed tomography era experience with 973 patients. World Neurosurg. 2011;75:716–26; discussion 612.
11. -Patel K, Clifford DB. Bacterial brain abscess. Neurohospitalist. 2014;4:196–204
12. -Li X, Tronstad L, Olsen I. Brain abscesses caused by oral infection. *Endod Dent Traumatol*. 1999;15:95–101.
13. -B. Lucke-Wold, et, all,.Dental Infections and Risk for Brain Abscess: A Literature Review. J. Dent. Oral. Health.Vol1, Iss(1). (2022).
14. -Daniels JS, AlBakry I, Braimah RO, et al. Cerebral abscess: a complex complication of odontogenic infection: a case report and review of the literature. Surgeries. 2019;1:1–7
15. -Bally J, Curien R, Brenot S, Sourdot A, Lê A, Bravetti P. Abcès cérébraux d’origine dentaire: à propos de deux cas. *Actual Odonto-Stomatol* 2009;*(248):361–7.*
16. -Wu X, Qin N, Peng X, Wang L. Exploring odontogenic brain abscesses: a comprehensive review. Acta Neurol Belg. 2024;124(4):1155–1165.

17. -Kichenbrand C, Marchal A, Mouraret A, et al. Brain abscesses and intracranial empyema due to dental pathogens: Case series. *Int J Surg Case Rep* 2020;*69*:*35–8*.
18. -Ewald C, Kuhn S, Kalff R. Pyogenic infections of the central nervous system secondary to dental affections-a report of six cases. Neurosurg Rev. 2006;29:163–6; discussion 166
19. -Maraby-Salgado J, Hoz SS, Narvaez-Rojas A, et al. Brain abscess and dental infections: a review. Romanian Neurosurg. 2018;32:283–9
20. -Greenlee JE. Subdural Empyema. Curr Treat Options Neurol. 2003;5(1):13–22. doi: 10.1007/s11940-003-0019-7. PMID: 12521560.
21. -Ruiz-Barrera MA, Santamaría-Rodríguez AF, Zorro OF. Brain abscess: a narrative review. Neurol Perspect. 2022;2:160–7

Figures



Figure 1

Panoramic radiograph showing the impacted maxillary right third molar (18)



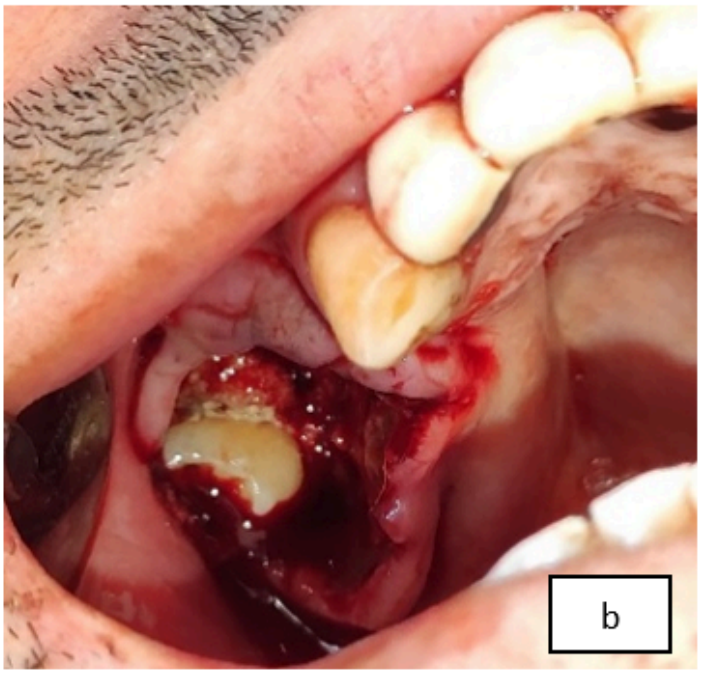


Figure 2

Peroperative views (a) Gross specimen showing a bone sequestrum associated with the extraction site of tooth 17. (b) Intraoperative photograph demonstrating the exposure of the impacted maxillary right third molar (tooth 18).

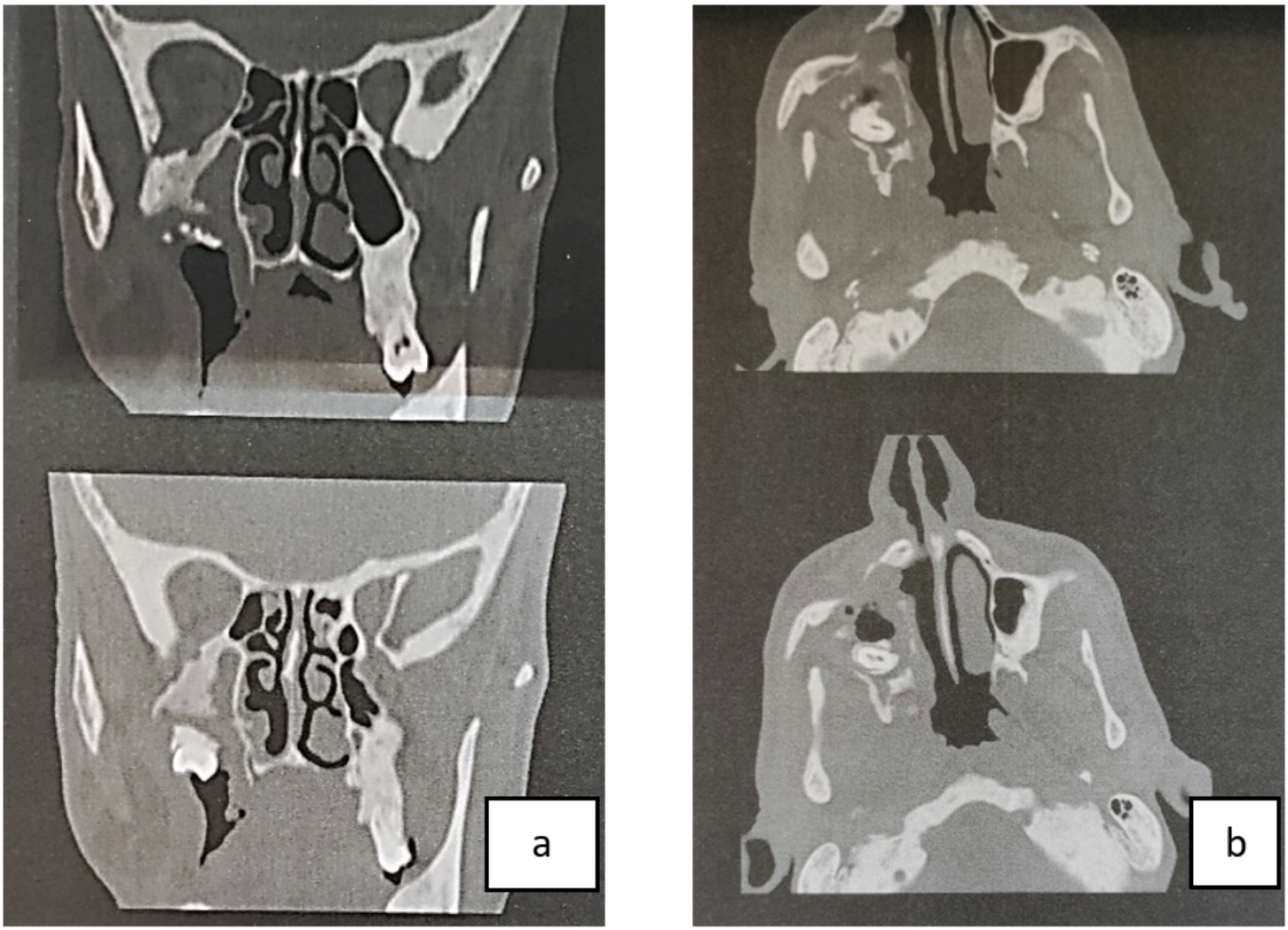


Figure 3

CT Scan: Coronal (a) and axial (b) CT images demonstrating an extensive mixed osteolytic–osteosclerotic lesion involving the posterior right maxilla



Figure 4

Extracted tooth 18



Figure 5

Intraoperative view following sequestrectomy and surgical debridement of the right posterior maxilla

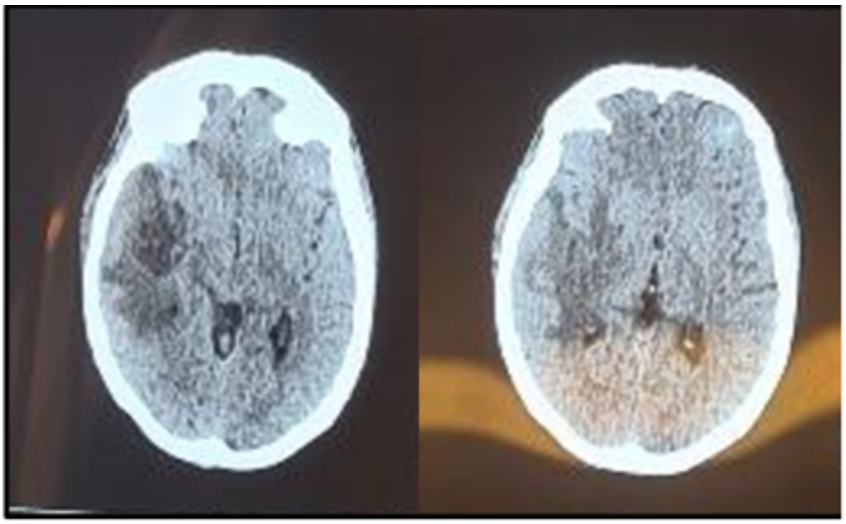


Figure 6

Axial brain CT scan images demonstrating a right temporal hypodense lesion surrounded by vasogenic edema, producing mild local mass effect

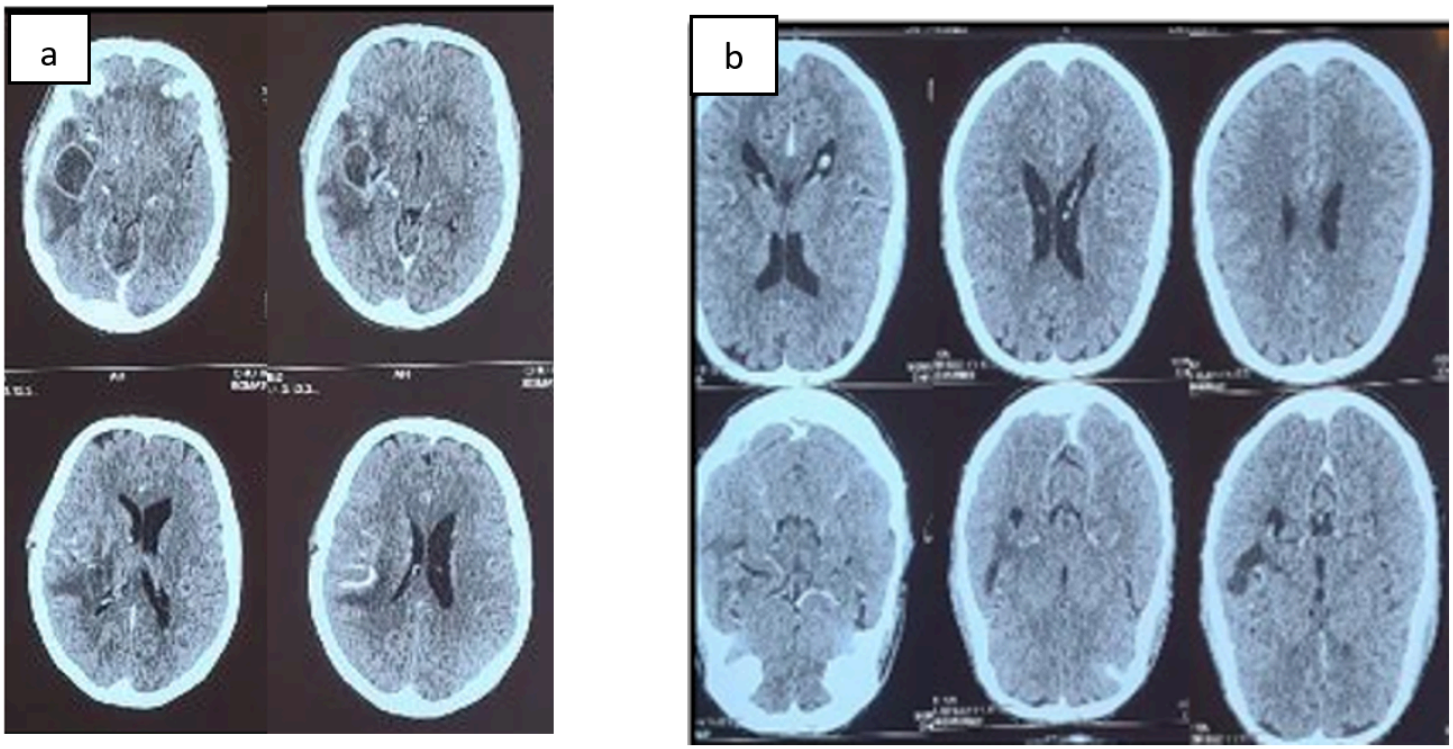


Figure 7

Follow-up brain CT scans. (a) One-month follow-up image showing a marked reduction in abscess size. (b) Three-month follow-up demonstrating near-complete resolution of the abscess with no residual mass effect.



Figure 8

the final obturator Prothesis