Case Report

ANNALS OF MEDICINE & SURGERY

OPEN

Fungal skull base lesion masquerading as malignancy: a diagnostic dilemma. Illustrative case report

Kodeeswaran M, MCh[a], S. Muthuchitra, MS[b], Noorul Hidhaya S., MBBS[c], Vishaal P., MBBS[c], P.B. Janakiraman, MS, DLO[b], Tamilarasan P., MS[b], Priyadharshan K.P., MCh[a], Jamila Alagarsamy, MD[b], Gaurav R. Dhoka, MCH[a], Bipin Chaurasia, MS[d,*]

Introduction: The clivus is an uncommon site for fungal infections and is typically associated with tumors or metastases. Invasive fungal sinusitis extending to the skull base is exceptionally rare and often mimics clival malignancies such as chordomas or metastases. This overlap in clinical and radiological features can lead to diagnostic delays.

Case presentation: The authors present a case of a 36-year-old immunocompetent male who presented with symptoms and imaging findings suggestive of a malignant skull base tumor, particularly clival chordoma. However, histopathological analysis revealed invasive fungal sinusitis with clival involvement.

Discussion: In skull base lesions, particularly those involving the clivus, fungal infections should remain a differential diagnosis, even in patients without immunocompromising conditions. Early diagnosis using biopsy and microbiological analysis is essential for appropriate surgical management and antifungal therapy.

Conclusion: This case highlights the importance of considering the fungal etiology in clival lesions, especially in high-risk patients. Prompt diagnosis and a multidisciplinary approach can significantly improve the outcomes in rare and complex presentations.

Keywords: clival chordoma mimic, clival lesions, fungal sinusitis, immunocompetent patients, invasive fungal infections, skull base invasion, surgical management

Introduction

Clival masses, although uncommon, present substantial diagnostic and therapeutic challenges as they are close to crucial neurovascular structures at the skull base[1]. It usually presents with non-specific symptoms such as headaches, neck pain, and cranial nerve deficits as a result of pressure on neighboring structures[2]. Chordomas, metastatic tumors, and less typically invasive fungal infections are among the differential diagnoses of clival lesions[3,4]. Accurate preoperative diagnosis is critical, as treatment options vary greatly depending on the underlying illness.

In this report, we present a case of a clival mass that was initially thought to be malignant but was later confirmed as invasive fungal sinusitis, illustrating the diagnostic problems and therapeutic approach for such cases.

[a]Department of Neurosurgery, Government Kilpauk Medical College, Chennai, India, [b]Government Kilpauk Medical College, Chennai, India, [c]Stanley Medical College and Hospital, Chennai, India and [d]Department of Neurosurgery, Neurosurgery Clinic, Birgunj, Nepal

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

*Corresponding author. Address: Department of Neurosurgery, Neurosurgery Clinic, Birgunj, Nepal. E-mail: trozexa@gmail.com (B. Chaurasia).

Annals of Medicine & Surgery (2025) 87:929–933

Received 7 November 2024; Accepted 12 January 2025

Published online 20 December 2024

http://dx.doi.org/10.1097/MS9.0000000000002964

This case report has been reported in line with SCARE 2023 guideline[5].

Illustrative case

A 36-year-old male presented with a 2-month history of left ear discharge and ringing sensation, accompanied by neck pain, nausea, vomiting, and giddiness. There was no notable medical history or any comorbidities.

Clinical examination revealed grade 2 tympanic membrane retraction with a small central perforation and active mucopurulent discharge in the left ear. By contrast, the tympanic membrane of the right ear was intact. On diagnostic nasal endoscopy, a smooth, globular pedunculated mass was shown to originate from the sphenoid cavity, which extended into and filled the choana and nasopharynx on the left side. No palpable neck lymph nodes were found. Neurological examination of the peripheral nervous system revealed that all the cranial nerves were intact. Complete blood count and metabolic panel tests were performed, and the results were within normal limits. There were no immunosuppressive conditions or diabetes in the patient.

Brain computed tomography (CT) revealed an expansile lytic soft tissue density lesion with internal hyperdense regions in the left clivus and pituitary fossa. The lesion extended anteriorly into the left chamber of the sphenoid sinus, laterally causing erosion of the petrous part of the left temporal bone, and inferiorly resulting in erosion of the sphenoid bone. An MRI of the brain revealed a heterogeneously enhancing malignant solid-cystic mass lesion at the skull base in the middle cranial fossa. This lesion involved the sella, clivus, and left chamber of the sphenoid sinus (Figs 1 A,B and 2).

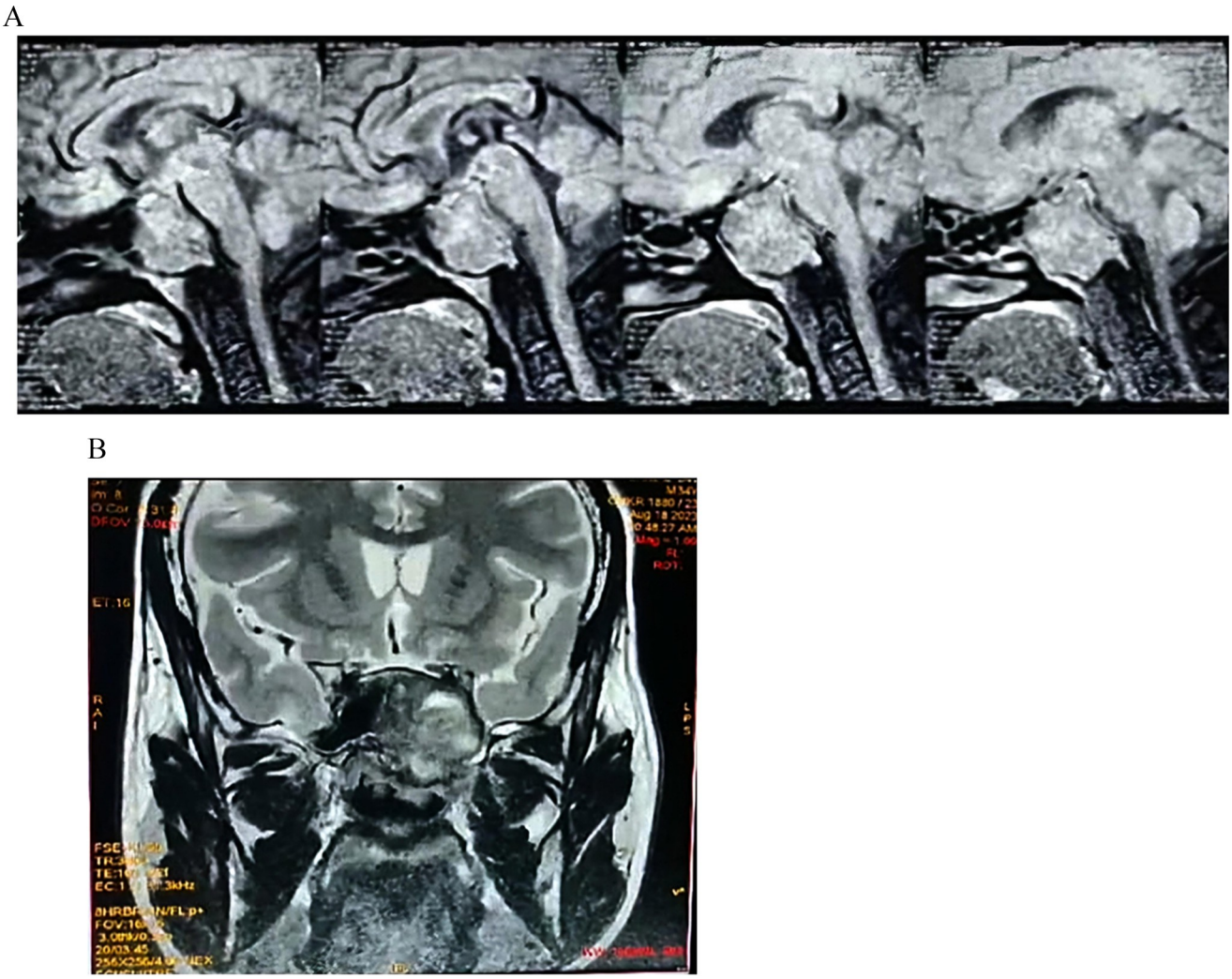

Figure 1. Magnetic resonance imaging in the multiple sagittal section (A) and coronal section (B) reveal a hyperintense lesion occupying the left clivus and is seen extending into the pituitary fossa.

Clinical and radiological findings led to a provisional diagnosis of a malignant skull base tumor, most likely a chordoma or metastatic lesion. The patient and his family were counseled about the condition and the necessity of surgical intervention. Following the acquisition of anesthetic clearance, the patient was scheduled for surgery, which was performed by a team of ENT and neurosurgery specialists. Transnasal Endoscopic Excision of the lesion from the clivus area was performed, preceded by a posterior septotomy and removal of the sphenoid rostrum to expose the clivus. The entire lesion was aspirated. Closure was achieved using fat grafts, and a surgical biopsy specimen was submitted for histopathological examination. Interestingly, the histopathological report revealed fungal elements with minimal associated inflammatory hyphae (Fig. 3). Fungal culture of the biopsy specimen was also performed, which confirmed the presence of *Aspergillus* species. This led to a diagnosis of invasive fungal sinusitis in the patient.

The patient was initially treated with intravenous Voriconazole at a dose of 6 mg/kg every 12 hours for the first 24 hours. This was followed by oral Voriconazole at a dose of 200 mg every 12 hours for 21 days and he was regularly followed up in the outpatient department. Over the course of the treatment, the patient's symptoms gradually improved. There were no subsequent episodes of ear discharge, and tympanic membrane perforation resolved. Three months after the surgery, the patient remained asymptomatic. Follow-up MRI performed three months post-surgery demonstrated a significant reduction in lesion size, with no evidence of active disease or residual fungal infection. Six months post-surgery, MRI confirmed complete resolution of the lesion and no signs of recurrent fungal elements. During follow up, the patient reported significant improvement in resolution of symptoms and enhanced quality of life following the surgical procedure and antifungal therapy.

Discussion

The clivus is an important feature at the base of the skull, forming part of the central skull base and is located directly anterior to the brainstem. Because of its proximity to key neurological organs such as the brainstem, cranial nerves, and major blood arteries, the clivus is a common site for malignancies and

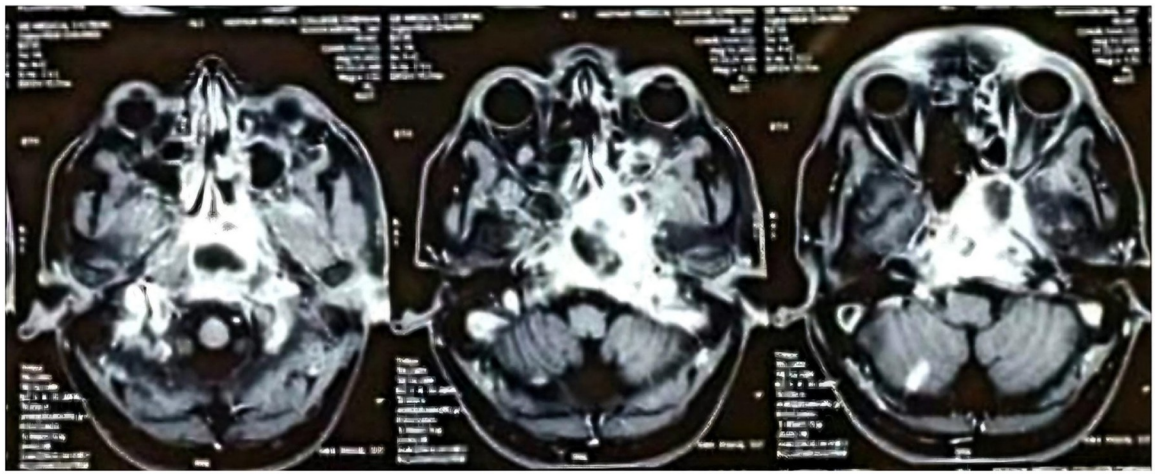

Figure 2. T1 weighted magnetic resonance imaging in the axial cut reveals a hyperintense mass that is solid-cystic in nature causing erosion of the sphenoid bone in the middle cranial fossa.

metastatic lesions[1,6]. The high vascularity of this region also makes it a target for metastatic spread, notably from primary cancers of the lungs, breast, and prostate, which are known to metastasize to the bones, including the skull base[2,7]. Clinical signs of Clival tumors tend to be non-specific, including headaches, cranial nerve deficits, and neck pain, which are usually caused by a mass impacting on nearby structures[2,8].

However, the prevalence of clival tumors is still quite low, accounting for approximately 0.1-0.4% of all intracranial cancers, with chordomas being the most prevalent primary clival tumor[9,10]. Clival metastases are extremely uncommon, with less than 60 cases described in the literature; however, they are an important factor in the differential diagnosis of skull base lesions due to the aggressive nature of metastatic cancers and their potential impact on prognosis.

In our case, the clinical presentation and imaging data led us to tentatively diagnose a malignant skull base tumor, namely clival chordoma. The patient's symptoms of ear discharge, neck pain, nausea, and giddiness, together with imaging findings of an expansile, lytic lesion encompassing the clivus and sphenoid sinus, strongly suggested a malignant cause. Clival chordomas, which develop from notochordal remains, are slow-growing but extremely invasive tumors that cause widespread bone damage[11]. They frequently manifest with cranial nerve impairments or other symptoms of mass impact, which aligns with the findings of our patient[12,13]. In addition to clival chordoma, the differential diagnoses included soft tissue sarcoma and clival metastases, both of which can show aggressive local invasion and destructive lesions on imaging[3,4]. The clinical and radiological overlap of the clival chordomas, metastatic lesions, and fungal infections made this case particularly difficult to diagnose.

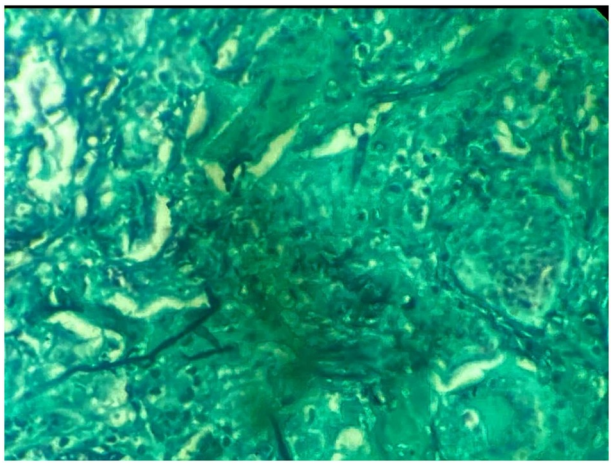

Figure 3. Grocott-Gomori methenamine silver (GMS) stained preparation of biopsy specimen in high power view (40x) showing branching septate fungal hyphae.

In this case, histological analysis of the biopsy specimen revealed a definite diagnosis of Invasive *Aspergillus* sinusitis with skull base involvement. Grocott-Gomori methenamine silver (GMS) staining of the biopsy samples revealed branching septate fungal hyphae consistent with *Aspergillus* species[14,15]. No evidence of cancer or inflammatory cell infiltration was observed. Fungal culture confirmed the presence of *Aspergillus* species, confirming the histological diagnosis. The culture also ruled out other fungal pathogens, such as Mucor or Candida, which can cause comparable invasive sinusitis but require distinct treatment techniques. Together, these findings established definitive evidence of invasive fungal infection involving the clivus and ruled out a previously assumed malignant origin. These infections normally advance from the sphenoid sinus to the skull base, causing osteomyelitis and the creation of a fungal ball over time, which likely matched the behavior of a malignant tumor in this patient[16-18]. If left untreated, it can result in life-threatening consequences such as cranial nerve impairment, meningitis, or cavernous sinus thrombosis. Histopathological findings are crucial for excluding other potential diagnoses and for guiding appropriate antifungal therapy.

A thorough search of the electronic databases revealed only a few studies that explicitly addressed the frequency of fungal sinusitis penetrating the skull base. Among the studies reviewed, the prevalence rates differed owing to changes in the study demographics, diagnostic criteria, and methodology. Notably, Hyuang *et al* found that approximately 12% of patients with

confirmed fungal sinusitis had skull base involvement[19]. Another study by Friedma *et al* discovered a 10–15% prevalence in a cohort of immunodeficient patients following surgical intervention for invasive fungal sinusitis[20].

Although rare, fungal sinusitis with skull base involvement is becoming increasingly recognized, as demonstrated by Naik *et al*, highlighting the increased awareness of such instances in clinical practice. This can be attributed to new imaging techniques such as high-resolution CT and MRI, which provide more detailed observation of the degree of fungal involvement, including subtle erosions of the skull base that were previously overlooked[21,22].

The rarity of fungal infections in the clivus, especially in an immunocompetent patient, highlights the importance of this case. Fungal sinusitis with skull base involvement is typically associated with immunocompromised individuals, particularly those with uncontrolled diabetes or those receiving immunosuppressive medication[23-25]. However, our patient was immunocompetent and had no underlying comorbidities, making this an extremely uncommon presentation. Fungal infections are extremely infrequent in such individuals and may be misdiagnosed as malignant tumors on imaging. This emphasizes the importance of a multidisciplinary approach, comprising of neurosurgeons, radiologists, and pathologists, in the treatment of complex skull base lesions.

Conclusion

In conclusion, this case of fungal sinusitis with skull base invasion, masquerading as a clival chordoma, is a rare and significant clinical entity. The involvement of the clivus, a structure of critical anatomical importance, compounded by the rarity of fungal infections in immunocompetent individuals, makes this case a notable contribution to the literature. The combination of advanced imaging, careful clinical evaluation, and histopathological confirmation is crucial for achieving the correct diagnosis and successful management of this challenging case.

Ethical approval

Not applicable.

Consent

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

Sources of funding

All the authors declare to have received no financial support or sponsorship for this study.

Author's contribution

Writing the paper: M.K., S.M., H.S.N.; study concept or design, data collection, data analysis, or interpretation: P.C., P.B.J., P. T., K.P.P., J.A., G.R.D., B.C.

Conflicts of interest disclosure

All the authors declare to have no conflicts of interest relevant to this study.

Research registration unique identifying number (UIN)

Not applicable.

Guarantor

Bipin Chaurasia.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Data availability statement

Not applicable.

References

[1] Palsetia DR, Vijan AV, Gala FB, *et al*. Clival and paraclival lesions: a pictorial review. Indian J Radiol Imaging 2023;33:201–17.
[2] Khawaja AM, Venkatraman A, Mirza M. Clival chordoma: case report and review of recent developments in surgical and adjuvant treatments. Pol J Radiol 2017;82:670–75.
[3] Carretta A, Sollini G, Guaraldi F, *et al*. Clival metastases: single-center retrospective case series and literature review. J Clin Med 2024a; 13:2580.
[4] Ilaslan H, Schils J, Nageotte W, *et al*. Clinical presentation and imaging of bone and soft-tissue sarcomas. Cleve Clin J Med 2010;77 Suppl 1:S2–7.
[5] Sohrabi C, Mathew G, Maria N, *et al*. The SCARE 2023 guideline: updating consensus Surgical CAse REport (SCARE) guidelines. Int J Surg 2023;109:1136–40.
[6] Pagella F, Ugolini S, Zoia C, *et al*. Clivus pathologies from diagnosis to surgical multidisciplinary treatment. Review of the literature. Acta Otorhinolaryngol Ital 2021;41:S42–S50.
[7] Jozsa F, Das JM. Metastatic lesions of the clivus: a systematic review. World Neurosurg 2022;158:190–204.
[8] Miptah HN, Badlishah-Sham SF, Hashim H, *et al*. Clival chordoma in an adolescent: a perspective from primary care. Korean J Fam Med 2020;41:427–30.
[9] Yoshikawa-Kimura A, Taira K, Katanosaka Y, *et al*. A rare case of clival metastasis in a patient with gastric cancer. Intern Med 2020;59: 3161–64.
[10] Baier MP, Cheong DA, Shi HH, *et al*. Decision-making in clival mass lesions: risk factors for malignant disease and an illustrative case example. J Neurol Surg Rep 2023;84:e156–e162.
[11] Munari S, Colangeli R, Ramacciotti G, *et al*. Clivus chordoma: case report and current considerations on treatment strategies. J Int Adv Otol 2020;16:286–90.
[12] Young VA, Curtis KM, Temple HT, *et al*. Characteristics and patterns of metastatic disease from chordoma. Sarcoma 2015;2015:517657.
[13] Chen G, Li M, Xu W, *et al*. Surgical outcomes of CLIVAL chordoma through endoscopic endonasal approach: a single-center experience. Front Endocrinol (Lausanne) 2022;13. doi:10.3389/fendo.2022. 800923
[14] Fernández-Cruz A, Magira E, Heo ST, *et al*. Bronchoalveolar lavage fluid cytology in culture-documented invasive pulmonary aspergillosis in patients with hematologic diseases: analysis of 67 episodes. J Clin Microbiol 2018;56. doi:10.1128/jcm.00962-18
[15] Hu Y, Zheng L, Pan D, *et al*. Special staining of the liquid-based cytopathology test in bronchoalveolar lavage fluid for diagnosis of invasive pulmonary aspergillosis with nonneutropenic patients. Can Respir J 2020;2020:1–9.

[16] Yang X, Zhang Y, Jing Q, *et al*. Aspergillus osteomyelitis of clivus. World Neurosurg 2018;120:15–16.
[17] Borges A, Ferreira L, Pacheco R, *et al*. Invasive aspergillosis of the skull base in an immunocompetent patient: a diagnostic challenge. BMJ Case Rep 2021;14:e245517.
[18] Pinzer T, Reiß M, Bourquain H, *et al*. Primary aspergillosis of the sphenoid sinus with pituitary invasion – a rare differential diagnosis of sellar lesions. Acta Neurochir (Wien) 2006;148:1085–90.
[19] Huang Y, Zhang S, Li Y, *et al*. Prevalence and clinical features of fungal sinusitis with skull base invasion. Am J Rhinol Allergy 2020;34:646–52.
[20] Friedman M, Toohill R, Ginsberg R. Invasive fungal sinusitis: a comprehensive review of skull base involvement. J Clin Otolaryngol 2019;45:123–29.
[21] Naik A, Yang DB, Bellafiore FJ, *et al*. Chronic allergic fungal sinusitis invading the skull base in an immunocompetent male: illustrative case. J Neurosurg Case Lessons 2021;1:CASE2161.
[22] Deutsch PG, Whittaker J, Prasad S. Invasive and non-invasive fungal rhinosinusitis – a review and update of the evidence. Medicina (B Aires) 2019;55:319.
[23] Bhuskute GS, Keshri AK, Seduchidambaram M, *et al*. Changing spectrum of invasive fungal infections of the anterior skull base. J Neurol Surg B Skull Base 2023;85:458–64.
[24] Sethi S, Siraj F, Kalra KL, *et al*. Aspergillus vertebral osteomyelitis in immunocompetent patients. Indian J Orthop 2012;46:246–50.
[25] Tack KJ, Rhame FS, Brown B, *et al*. Aspergillus osteomyelitis. Am J Med 1982;73:295–300.