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Case Report

Sphenoid sinus fungal ball mimicking central skull base tumour: Case report

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Abstract

Isolated sphenoid sinus fungal infection in an immunocompetent patient is uncommon and can often mimic skull base malignancy. We present a case report of a 53-year-old lady who was found to have an expansile hyperdense mass lesion in the sphenoid sinus with bony destruction, specks of calcification and extension into the posterior nasal cavity on CT. Contrast enhanced MRI demonstrated T2 hypointense and T1 hyperintense signal in the mass with a thin rim of peripheral enhancement. Diagnosis of clival chordoma with haemorrhage was considered on imaging. Nasal endoscopy showed the mass extending into the right middle meatal region. The patient underwent endoscopic endonasal surgery with planned tumour debulking. Intraoperatively, the paranasal sinuses showed bony destruction with yellowish debris in both maxillary sinuses, ethmoidal sinuses and the sphenoid sinuses. Following debridement of the tissue, the skull base dura was seen with no breach or invasion. The sampled tissue material showed Aspergillus flavus growth on microbiology. The patient was started on antifungals and made a full recovery.

Keyword: Fungal ball, Sphenoid fungal sinusitis, Clival mass, T1 hyperintense signal

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1. Introduction

Fungal infection of the paranasal sinuses can be invasive or non-invasive.[1] The invasive form can be acute or chronic and is characterised by the presence of fungal hyphae in the mucosa, bone or blood vessel. Non-invasive forms present in the form of fungal ball or allergic fungal sinusitis and may be seen immunocompetent individuals.[2 -3] The non-invasive fungal ball or mycetoma can be seen in older individuals with female predilection.[2] While the chronic invasive forms of sphenoid sinus fungal involvement present with symptoms of headache or symptoms secondary to involvement of cavernous sinus and cranial nerves of the skull base, the non-invasive fungal balls are often asymptomatic.[2,4] Isolated sphenoid sinus fungal balls are difficult to diagnose due to the paucity of symptoms and due to imaging features of bone expansion and destruction mimicking skull base malignancy.[5-7]

2. Case History

A 53 year old lady presented with a history of headache and vomiting following a car journey. At her presentation she was found to have an elevated blood pressure of 160/90. She had no neurological signs or symptoms and was not a known diabetic or hypertensive. She underwent a CT scan of the brain to rule out any intracranial bleed as the cause of her symptoms.

2.1. Imaging findings

Plain CT of the brain (**Figure 1** a-d) demonstrated a large poorly marginated hyperdense mass lesion in the central skull base involving the planum sphenoidale, posteriorly extending into the clivus and anteriorly into the posterior part of the nasal cavity with destruction of the posterior part of the septum and involvement of the superior and middle turbinates in the nasal cavity. The mass showed specks of calcifications within and there was severe thinning and destruction of the bony walls of the central skull base.

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Laterally, the mass was seen extending partially into the region of cavernous sinuses bilaterally, with scalloping of bilateral petrous apices. Posteriorly, there was extension of the mass beyond the bony walls of the clivus into the prepontine cistern. Destruction of the floor of sella was noted. Bilateral maxillary and ethmoid sinuses showed hypodense soft tissue fluid density.

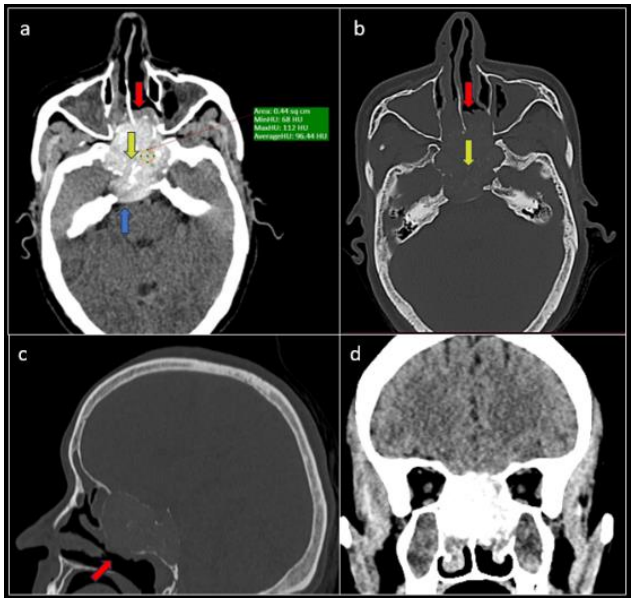

Figure 1: Axial CT in brain parenchymal and bone window (a,b), Mid sagittal reformatted image in bone window (c) and coronal CT in brain parenchymal window. The CT images show a hyperdense lesion (Attenuation of 96 HU) involving the central skull base in the body of sphenoid and clivus, causing destruction and expansion of the bone. Specks of calcification are seen within (yellow arrow).Anteriorly, there is extension of the mass into the posterior nasal cavity with destruction of the posterior part of the nasal septum (red arrow). Posteriorly, the mass extends into the prepontine cistern (blue arrow). Also seen is soft tissue density of fluid attenuation in bilateral maxillary sinuses MRI of the brain with contrast (**Figure 2 a-d**) was performed further characterisation and delineation of the lesion.

The mass was hypointense on T2 and hyperintense on T1. Postcontrast study showed a thin rim of peripheral enhancement along the walls of the expanded sinus cavity, with involvement of the adjacent dural lining over bilateral medial temporal lobes. There was extension of the mass bilaterally into the cavernous sinuses with partial encasement of bilateral cavernous segments of internal carotid arteries, however, with no luminal compromise.

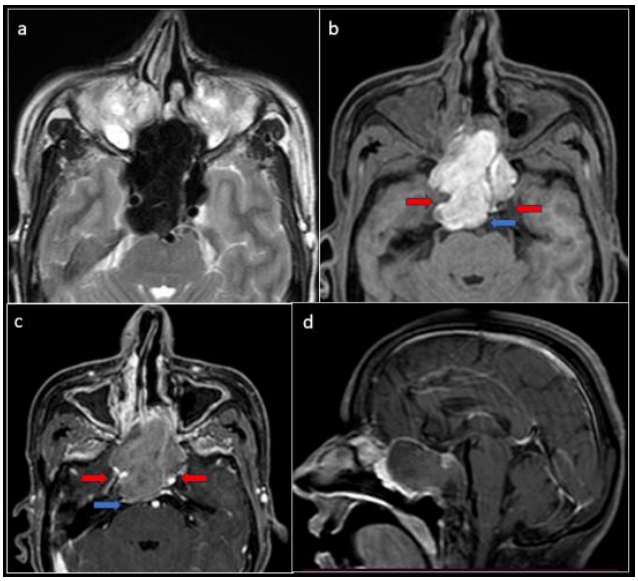

Figure 2: Contrast enhanced MRI study of the brain- axial T2 (a), axial T1 (b), axial and sagittal postcontrast T1–FS sequences (c and d). The central skull base mass appears hypointense on T2 and hyperintense on T1. Laterally there is extension into bilateral cavernous sinuses with partial encasement of bilateral cavernous ICA (red arrows). Posterior extension of the mass into the prepontine cistern (blue arrow) is noted and anteriorly, the extension into the nasal cavity is demonstrated, as noted on the CT images. Postcontrast study shows peripheral rim enhancement, with the thin enhancing rim in contiguity with the dura overlying bilateral medial temporal lobes. T2 hyperintense and T1 hypointense contents of fluid signal are seen in bilateral maxillary sinuses with thin rim of enhancement along the mucosal lining of the maxillary sinuses on the postcontrast study.

Given the clinical history of the patient and the imaging findings of extensive bone destruction, presence of calcification, hyperdensity on CT and MR signal intensity, the possibility of chordoma with haemorrhage was considered. The remote possibility of chronic infection, though mentioned as a possible differential diagnosis, was considered less likely given the immunocompetent status of the patient and lack of systemic features of any infection or inflammation. The patient initially underwent a diagnostic nasal endoscopy, which showed a large mass bulging into the nasal cavity from the skull base with flakes of necrotic tissue. Routine preoperative investigations were done, which did not suggest any immune deficiency.

2.2. Surgical and microbiology findings

The patient underwent endoscopic endonasal procedure with the intent to debulk the tumour. Intraoperatively, on opening both maxillary sinuses, thick pus and flaky material was noted which was removed. Further exploration of the ethmoid and sphenoid sinuses showed yellowish flaky material, which was removed piecemeal (**Figure 3** a,b). Following removal of the material, the skull base dura was seen with no breach

or invasion; sellar impression was noted and complete clearance upto the tumour margins was confirmed with neuronavigation (**Figure 3** c). Thorough wash was given and the nasal cavity packed. Post-operative imaging showed complete clearance of the lesion (**Figure 4**). The patient was discharged after removal of the nasal packs and underwent bi-weekly nasal toileting. She was asymptomatic at her last follow-up.

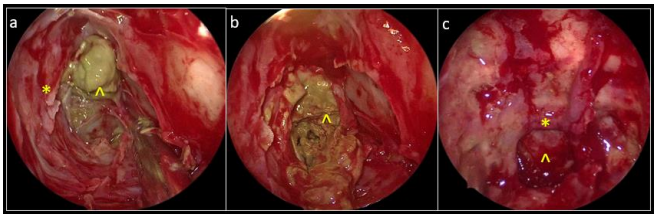

Figure 3: a: Intraoperative Endoscopic Image via Left nostril showing Septum (*) and the necrotic yellowish fungal lesion within the sphenoid sinus (^). **b:** Intraoperative Endoscopic Image via Left nostril showing the necrotic yellowish fungal lesion within the sphenoid sinus (^). **c:** Intraoperative Endoscopic Image following removal showing Sella (*) and dura under the destroyed clivus (^)

Figure 4: Post-operative axial CT in bone window at the level of sphenoid sinus shows complete clearance of the previously noted hyperdense contents in the central skull base.

Direct KOH examination of the fluid submitted showed septate hyphae with acute angle branching (**Figure 5** a). The material was inoculated on Sabouraud dextrose agar (SDA) and after 72 hours, velvety yellow colonies of Aspergillus flavus growth was noted (**Figure 5** b). Lactophenol cotton blue preparation of the colonies demonstrated conidiophores of variable length, phialides which were uniseriate and double covered the entire vesicle **Figure 5**(c).

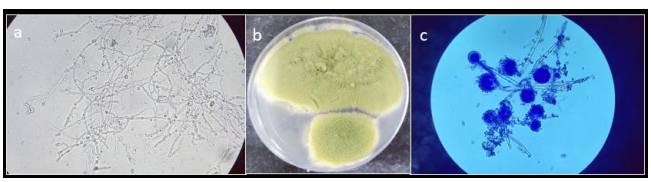

Figure 5: a: Direct KOH examination of the fluid showing hyaline septate hyphae with acute angle branching. b: Green velvety colonies of Aspergillus flavus on Sabouraud dextrose agar (SDA). c: Lactophenol cotton blue preparation of the colonies on SDA showing the conidiophores, phialides and vesicle of Aspergillus flavus.

The findings of sphenoid sinus fungal growth extending to the nasal cavity and the non- invasion of the dura or the adjacent blood vessels led to the final diagnosis of non-invasive fungal ball of the sphenoid sinus.

The patient was discharged after removal of the nasal packs and underwent bi-weekly nasal toileting. She was put on fluconazole 400 mg BD for 2 weeks and was asymptomatic at her last follow-up.

3. Discussion

Fungal ball, previously known as mycetoma or aspergilloma, is characterized by a mass of inspissated fungal debris progressively growing into the sinus cavity. It represents a tangled collection of fungal hyphae in the absence of allergic mucin.[2,8] There is no fungal invasion of the sinus mucosa, blood vessels, or bone, although chronic non-granulomatous inflammation may be observed in the mucosa.[2] Isolated sphenoid sinus fungal ball is an uncommon presentation , however recent literature shows an increasing detection of fungal balls in minimally symptomatic and asymptomatic patients, possibly due to increasing use of imaging in detecting unknown causes of headache and the use of broad-spectrum antibiotics.[8-9] Review of literature shows the maxillary sinus to be the predominant sinus to be involved with fungal ball (>80%), followed by the sphenoid sinus (14-18%).[9-12] The inflamed mucosal lining of the paranasal sinus appears hyperintense on T2-weighted images with contrast enhancement and the central sinus contents do not enhance.[2] The presence of T1 hyperintense signal and diffuse increased density on CT should lead to high degree of suspicion of fungal infection in an expansile sinus mass such as in our case.[11] T2 hypointense signal within the sinus cavity is also a notable feature of fungal sinusitis due to signal shortening caused by calcification and paramagnetic metals such as iron, magnesium, and manganese.[11]

Chordomas present as midline, locally aggressive osteolytic lesions, predominantly involving the clivus. They show variable attenuation on CT and may occasionally show intratumoral calcification. They generally show T1 low to intermediate signal and marked T2 hyperintense signal due to the presence of chondroid myxoid matrix.[2,13] However, presence of haemorrhage and myxoid contents can give rise to T1 hyperintense signal and the additional presence of calcification and fibrous septa can give rise to T2 hypointense signal.[5,13-14]

Skull base metastases involving the spheno-occipital region and chondrosarcomas are the other possible

differential diagnosis to be considered in expansile destructive skull base lesions.[13-14]

The expansile nature of the skull base mass in our case, together with clival involvement extending into the prepontine cistern and into the posterior nasal cavity led to the primary suspicion of expansile skull base neoplasm. The increased density on CT, the T1 hyperintense and T2 hypointense signal were attributed to the presence of calcification and possible haemorrhage, as may be seen in clival chordoma, however, the signal changes must also prompt consideration of invasive or non-invasive fungal infection. Bilateral maxillary sinuses in our case showed T2 hyperintense contents with no T1 hyperintense signal and thin enhancement of the mucosal rim post contrast: findings suggesting sinusitis but not specific for fungal sinusitis. Endonasal surgery is the treatment of choice for fungal balls, which clears the fungal debris from the affected sinus and establishes proper ventilation and drainage. Long-term systemic antifungal treatment is often not necessary in a non-invasive fungal ball, however, may be given if there is suspicion of invasive component.[10]

4. Conclusion

Isolated fungal ball of the sphenoid sinus is a form of non-invasive fungal sinusitis. It is an uncommon entity which may be seen in middle-aged women with no immunocompromise. Presence of expansile fungal ball causing destruction of the bony walls and extension into the clivus and adjacent compartments in the central skull base may mimic skull base neoplasm. Presence of hyperdense contents on CT, T1 hyperintense signal and T2 hypointense signal are important imaging findings which may point towards fungal sinusitis over neoplasm.

5. Source of Funding

None.

Conflict of Interest

None.

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