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## Invasive aspergillosis presenting as a cavernous sinus mass in immuno competent individuals; report of 3 cases

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**Abstract** Aspergillosis of the cavernous sinus is rare, especially in immuno competent individuals. We report three such cases secondary to paranasal sinus aspergillosis, with imaging findings.

**Key words** Cavernous sinus ·  
Magnetic resonance imaging ·  
Computed tomography

### Introduction

Cavernous sinus involvement due to aspergillosis in immuno competent individuals is rare. Few cases have been reported. We present three cases with varied imaging findings. Biopsy was performed in all patients.

### Case reports

#### Case 1

A 40-year-old woman presented with headache, fever, vomiting for 1 week and intermittent swelling of the face of 1 years duration. Examination revealed left proptosis, bilateral ptosis, restriction of ocular movements and signs of meningitis. CT showed features of bilateral cavernous sinus thrombosis with underlying basisphenoid osteomyelitis. Bilateral ethmoid and sphenoid sinusitis, enhancing exudates in the pontine cistern and left sylvian fissure with features of left frontotemporal meningoencephalitis were also seen (Fig. 1 a, f). MRI confirmed the CT findings and in addition, revealed an irregular, thick-walled, ring-enhancing lesion in the left frontal lobe. All the lesions were isointense on T1- and T2 weighted images and showed intense contrast enhancement (Fig. 1 b–e).

#### Case 2

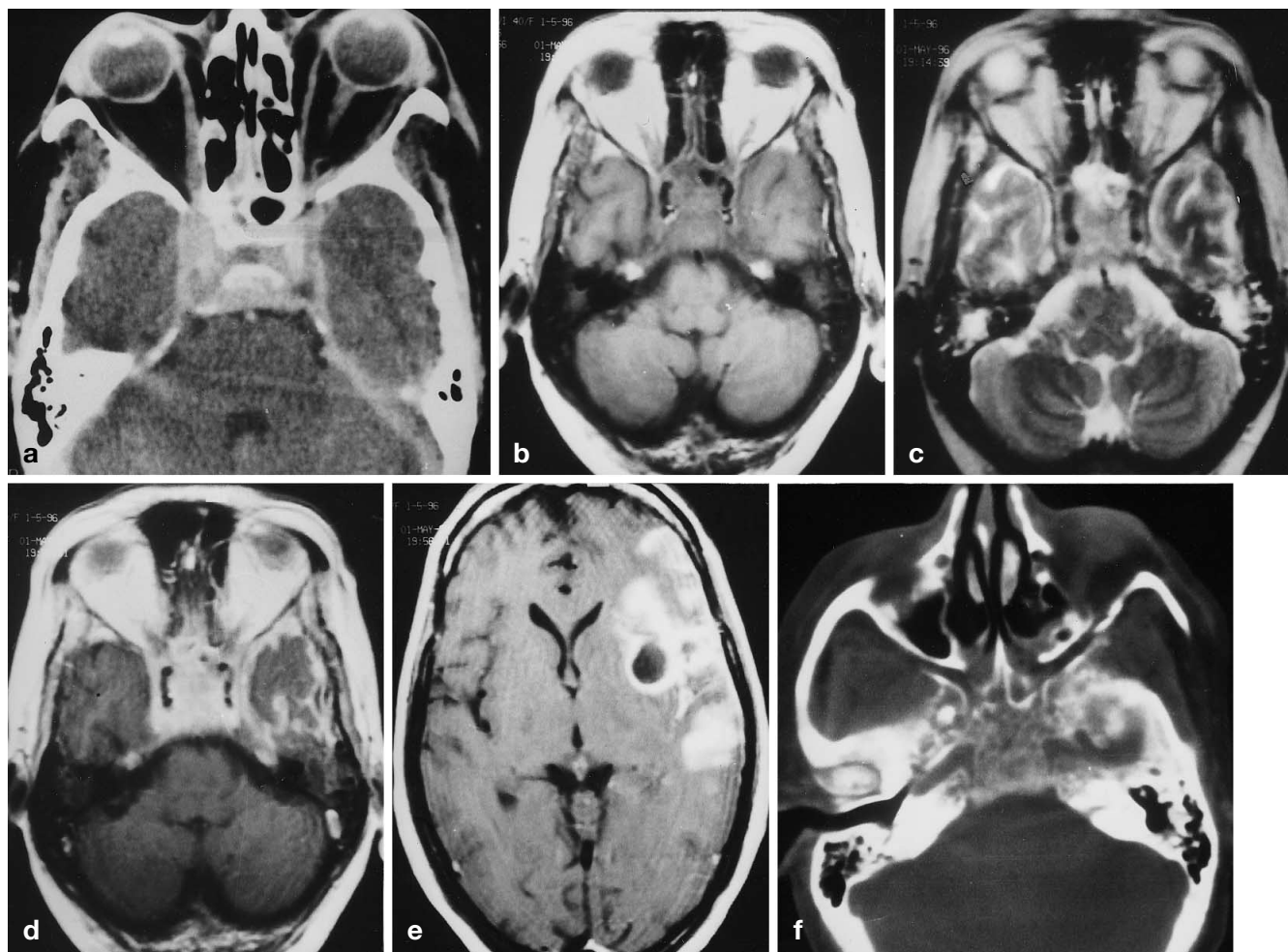
A 42-year-old woman presented with restriction of extraocular movements and decreased vision in the left eye, which improved gradually without treatment. A month later she developed a sudden right hemiparesis. Examination revealed lower motor neurone

lesions of the left II, III, IV, V, and VI cranial nerves and a right hemiparesis. MRI showed an infiltrative lesion in the left parapharyngeal area, pterygopalatine fossa, ethmoid and left sphenoid sinuses with extension into the left cavernous sinus, superior orbital fissure and Meckel's cave, and along the left trigeminal nerve. The lesions were isointense on T1-, T2-, and proton-density weighted imaging; all showed intense contrast enhancement (Fig. 2 a–c). In addition, non specific left maxillary sinusitis, left mastoiditis, and a mural left middle cerebral artery (MCA) territory infarct (Fig. 2 d) were seen. MR angiography showed occlusion of the left internal carotid artery (ICA) just distal to its origin (Fig. 2 e, f).

#### Case 3

A 34-year-old woman presented with restriction of movements and proptosis of right eye of 3 months duration. Examination revealed features of right cavernous sinus thrombosis, and lower motor neurone lesions of the III, IV, and VI cranial nerves. CT showed an enhancing soft-tissue lesion in the right nasal cavity, ethmoid and sphenoid sinuses, pterygopalatine fossa, superior orbital fissure and cavernous sinus, with extension into the left cavernous sinus. Bony erosion and sclerosis of the medial wall of the right orbit, ethmoid, anterior wall of left sphenoid sinus, and widening of the right superior orbital fissure were also seen (Fig. 3).

Biopsy in all patients revealed *Aspergillus fumigatus*. All patients were immunocompetent; there was no evidence of diabetes mellitus, immunosuppressive therapy of known syndromes (AIDS) in patient.



**Fig. 1a-f** Case 1. **a** Axial contrast-enhanced CT **b-c** T1-, T2- and contrast-enhanced T1-weighted images reveal cavernous sinus, parasellar and cerebral (left temporal lobe) aspergillosis as contrast enhancing areas on CT and isointense areas which enhance on MRI. **d** Axial contrast-enhanced T1 weighted image showing left frontotemporal abscess, with gyral and dural enhancement. **e** Axial contrast-enhanced T1 weighted image showing left frontotemporal abscess, with gyral and dural enhancement. **f** Bone-window CT showing erosion and sclerosis characterising the underlying basisphenoid osteomyelitis

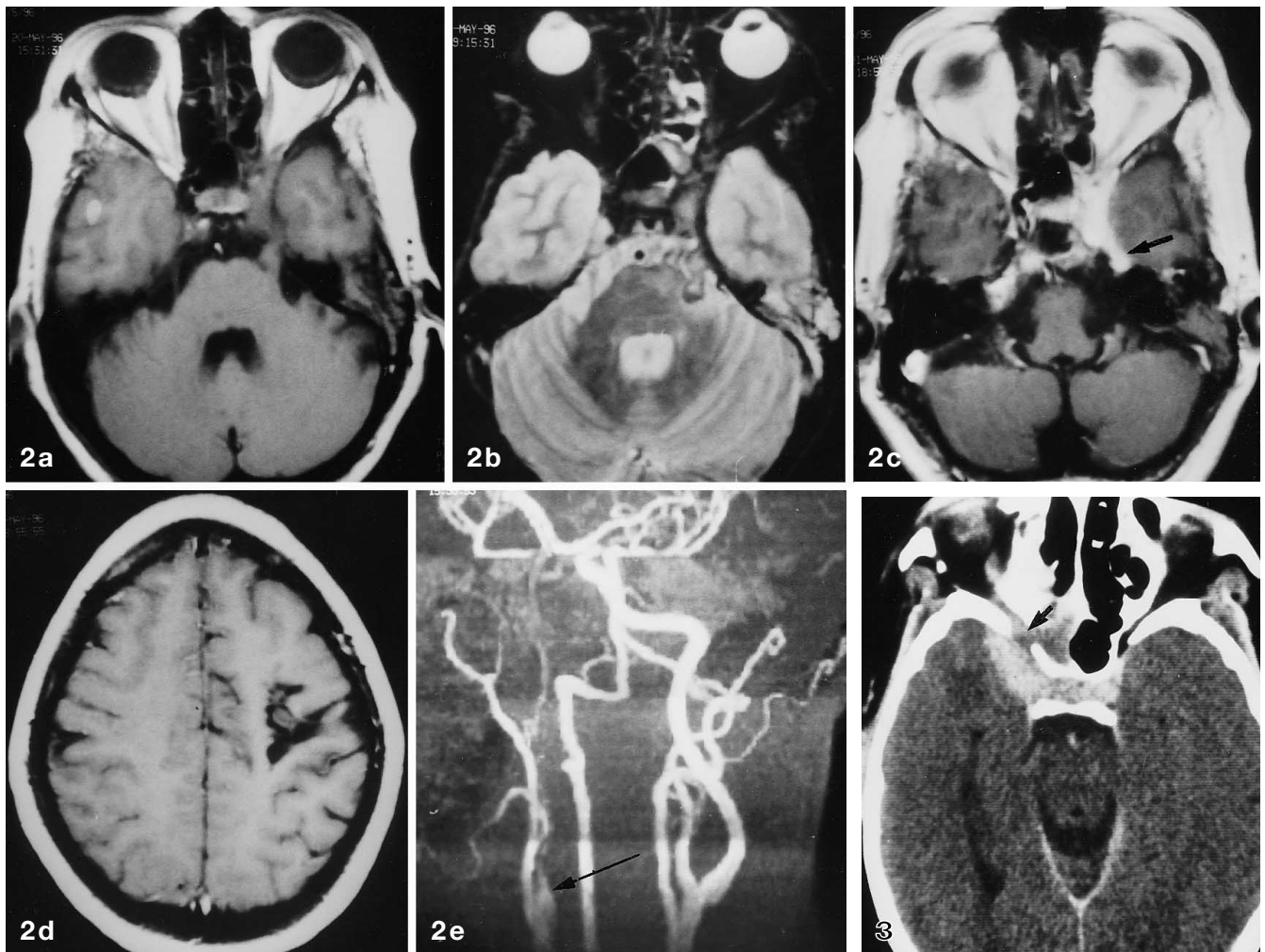
## Discussion

To our knowledge, only about 20 cases of aspergillosis of the cavernous sinus have been reported [1]. The disease is seen to affect immunocompromised patients, spread of infection from report adjacent structures such as the paranasal sinuses being most likely. We report cases of aspergillosis of the cavernous sinus with CT and MRI findings, in previously 'normal' immunocompetent individuals.

Disease in the cavernous sinus usually present as deep-seated orbital pain, fever, chemosis, proptosis, ptosis or ophthalmoplegia. Causes include neoplasm,

aneurysm, thrombosis, carotico-cavernous fistula, pituitary apoplexy, granulomatous inflammation and infection. Infection is most commonly due to spread the sinuses, orbit, middle ear or teeth. Sinusitis affecting the sphenoid and ethmoid air cells is today a rare cause of septic thrombosis of cavernous sinus in developed countries; it may be acute or chronic. Gram-positive bacteria such as *Staphylococcus aureus* are the predominant pathogens in acute conditions, while Gram-negative rods, and rarely fungi such as aspergillus and mucoraceae are responsible for chronic infections [2].

Nasal and paranasal sinus aspergillosis often presents as chronic sinusitis and has been described as having four types: allergic, noninvasive, invasive and fulminant [3]. The allergic form is akin to bronchopulmonary aspergillosis and is thought to be a combination of types 1 and 3 immunological reactions to aspergillus antigens [4]. Noninvasive disease results from the formation of an aspergilloma and behaves as chronic sinusitis [5]. The invasive form behaves like a malignant neoplasm and is seen in immunocompetent individuals. It is slowly progressive and locally destructive [6]. The rapidly de-



**Fig. 2a-e** Case 2. **a-c** T1-, T2- and contrast-enhanced T1-weighted images reveal isointense aspergillotic areas in the left cavernous sinus, parasellar region, Meckel's cave (*arrow*) and left sphenoid and ethmoid sinuses which enhance with contrast medium. **d** Axial T1-weighted image showing a mature left MCA territory infarct. **e** MRA revealing occlusion of left ICA just distal to its origin (*arrow*)

**Fig. 3** Case 3. Axial contrast-enhanced CT reveals an enhancing soft tissue mass involving the right posterior ethmoid and sphenoid sinuses, posterior orbit, and bilateral cavernous sinuses with underlying bony erosion. The right superior orbital fissure is widened (*arrow*)

structive, fatal fulminant form occurs in immunodepressed patients [7].

Cerebral aspergillosis arises most commonly as a result of haematogenous spread and occasionally by direct extension of infection from the paranasal sinuses, middle ear or orbit. It can also occur as a complication of intracranial surgery [8]. Most cases of cerebral aspergillosis occur in immunocompromised patients or in

those with some predisposing factor such as alcoholism, old age, diabetes mellitus, etc. [9], and very few cases have been reported in 'normal' patients. Cerebral forms manifest as meningitis, abscesses or as infarcts due to vascular involvement [10].

All our patients presented with clinical signs of cavernous and paranasal sinus involvement. Signs of cerebral infection (case 1) and infarction (case 2) were also seen. All the patients were normal, asymptomatic, and immunocompetent before the onset of the infection. Cases 1 and 3 were of the 'invasive' type, but case 2 did not fit into any of the classical types [3]. *Aspergillus fumigatus*, isolated in all our cases is the most common cause of human aspergillosis [11].

CT descriptions of cavernous sinus aspergillosis are rare. The lesions in our cases were bulky, contrast-enhancing masses with well defined low-density, non-enhancing foci (cases 1 and 3). On imaging, aspergillosis of the paranasal sinuses is reported to involve multiple sinuses, maxillary being the most and sphenoid the least common [12]. Bony changes such as erosion, sclerosis

are frequent and no characteristic enhancement pattern has been described. Imaging studies have shown calcium deposits and increased attenuation in the aspergilloma, which are considered characteristic [12–15]. The calcification is likely to represent healing or healed granuloma and is seen more often if the patient survives the infection [16]. CT in our cases revealed multiple sinus involvement (all cases), sclerosis and bone erosion (cases 1 and 3) and basisphenoid osteomyelitis (case 1). However, there was no evidence of calcification in either case in which CT was performed, despite their chronic nature. Also notable was involvement of the sphenoid sinus in all cases, while the maxillary sinuses were spared. Multiple embolic infarcts, ring-enhancing abscesses, and dural enhancement, with enhancing lesions in the adjacent paranasal sinuses or orbit are the neuroimaging patterns described in cerebral aspergillosis [13]. Cerebral abscesses, gyral and dural enhancement with enhancing lesions in the adjacent area were seen in case 1.

Decreased signal intensity on T1-weighted and very low signal on T2-weighted images are characteristic MRI findings in paranasal sinus aspergillosis [14], and have been attributed to of ferromagnetic elements and calcium in the fungal concretions. Infarcts, dural enhancement with enhancing lesions in the adjacent structures, and cerebral abscesses with low-signal rings on T2-weighted image has been described [10]. MRI findings in cavernous sinus and parasellar aspergillosis have rarely been described, but varied signal intensities of the aspergilloma on T2-weighted images have been reported [8]. All the lesions in our cases were iso-

intense with the brain parenchyma with all sequences and enhanced with contrast medium. We speculate that the absence of very low signal on T2-weighted images could be partially attributed to the absence of calcification in lesions. The left frontal cerebral abscess case 1 did not show any low-signal ring on T2-weighted images. However, this finding is relatively nonspecific and may be seen in conditions such as *like* pyogenic abscess, metastatic haematoma and subacute haematoma [10, 14].

The left MCA territory infarct due to occlusion of the left ICA just distal to its origin in one case may have been due to retrograde thrombosis from the cavernous portion [16]. Ten such cases of aspergillosis causing cerebral infarcts from occlusion of major vessels in immunocompetent or patients or those in the post-operative state have been reported [17].

Cavernous sinus aspergillosis should be considered as a cause of chronic cavernous sinus disease, presenting with cranial nerve palsies (especially III, IV and VI), even if the patient is immunocompetent. Cavernous sinus pathology associated with findings such as cerebral abscess, meningoencephalitis, infarcts etc, with coexistent invasive paranasal sinus disease which does not give high signal on T2-weighted images should strengthen the possibility that aspergillus is the causative agent. Unusual findings such as isointense signal on T2-weighted images, absence of calcification, involvement of the sphenoid sinuses and occlusion of major vessels are not infrequent in central nervous system and paranasal sinus aspergillosis.

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