Aspergilloma in the Paracavernous Region
—Two Case Reports—

Atul GOEL, Trimurti NADKARNI, and Anand P. DESAI*

Departments of Neurosurgery and *Neuropathology,
King Edward Memorial Hospital and Seth G.S. Medical College,
Bombay, India

Abstract
A 30-year-old male and a 40-year-old female presented with Aspergillus fungal granuloma in the cerebral locations involving the gasserian ganglion and its divisions in one case and was densely adherent to the lateral dural wall of the cavernous sinus in the other. Both patients were otherwise healthy with no evidence of immuno-suppression. The lesions resembled benign tumor on preoperative imaging and intraoperative consistency and vascularity. The lesions were successfully and completely resected. Both patients developed major cerebral arterial territory infarcts in the postoperative phase, remote from the site of operation, leading to crippling neurological deficits in one patient and death in the other. The unusual location and the unusual and similar clinical course suggests that awareness of the possibility of ischemic complications after surgical resection of intracranial aspergillomas is necessary.

Key words: aspergilloma, fungal granuloma, cavernous sinus, arterial thrombosis

Introduction
Intracranial fungal infections are being identified more frequently due to the increased numbers of auto-immune deficiency syndrome patients, better radiological investigations, more sensitive microbiological techniques, and better critical care of moribund patients. General awareness of the possibility of fungal infection has also increased.1,2,3

Aspergillus infection of the human brain is infrequent, and usually involves the species Aspergillus fumigatus.4,5 We describe the clinical presentation, radiological features, and management problems encountered in two patients with aspergillomas in the paracavernous sinus region and discuss the possible pathogenesis of the rather unusual clinical events.

Case Reports

Case 1: A 30-year-old male farmer presented with multiple focal seizures involving the right side of the body including the face persisting for 1.5 months. There was associated progressive right hemiparesis over the same period. He had also suffered moderate intensity headache and occasional vomiting for about 20 days.

On admission he could walk unaided only with difficulty. He had mild right hemiparesis but no other neurological deficit. Funduscopy was normal. Computed tomography (CT) and magnetic resonance (MR) imaging showed an enhanced lesion involving the lateral wall of the left cavernous sinus (Fig. 1).

The firm, fleshy, and moderately vascular lesion was excised through a basal pterional craniotomy. The lesion was intradural and adhered to the lateral wall of the cavernous sinus. The consistency and relationship to the dura strongly favored the diagnosis of a meningioma. Four doses of dexamethasone (4 mg i.v. at 6 hour intervals) were given during the operation and immediately postoperatively. However, histological examination showed the surprise finding of aspergilloma. HE staining showed a large number of lymphocytes, epithelioid cells, and areas of fibrosis with hyaline changes. Many refractile filamentous structures were seen, some with giant cells. Grocott-Gomori methenamine-silver (GMS) staining showed the irregular septate branching

Received January 12, 1996; Accepted May 7, 1996
hyphae characteristic of *Aspergillus*.

He was well immediately after the surgery. Amphotericin B therapy was started on the 5th postoperative day. One month later, during amphotericin B therapy, he developed acute left hemiplegia, ipsilateral to the side of the surgery. CT showed infarcts in the midbrain and anterior thalamus. Angiography was not done. A few days later he also developed pneumonia. His sensorium level waxed and waned. After a prolonged hospital stay he was taken home by relatives against medical advice in a moribund clinical state.

**Case 2:** A 40-year-old female suffered left temporal dull and continuous pain for 6 months. She developed medial deviation of the left eye for 12 days prior to admission.

Neurological examination found left sixth cranial nerve paresis and partial sensory loss (approximately 20%) over the maxillary and mandibular divisions of the fifth cranial nerve. There was wasting of left temporalis and masseter muscles. CT and MR imaging showed a lesion involving the gasserian ganglion and its roots, scalloping the petrous apex, and displacing the internal carotid artery inferiorly at the petrous apex and medially in the region of the cavernous sinus (Fig. 2). The clinical and radiological features were consistent with a trigeminal neurinoma involving the entire gasserian ganglion and extending into the posterior fossa.

She underwent selective left infratemporal fossa craniectomy with "interdural" resection of a large firm and fibrous tumor involving the entire Meckel's cave, all three divisions of the trigeminal nerve, and its extension into the posterior fossa. The lesion was confined to Meckel's dural cave with no extension into the venous spaces of the cavernous sinus and appeared to be a trigeminal neurinoma. The tumor was completely excised. The fifth cranial nerve could not be saved as the lesion had mingled with its fibers.

The postoperative course was uneventful for 3 days. However, on the 4th postoperative day she developed sudden onset of left hemiplegia ipsilateral to the side of the surgery. CT showed no vascular insult. Meanwhile, histological examination had showed that the lesion was an aspergilloma and amphotericin B therapy was started. Her condition progressively worsened to coma and she died on the 10th postoperative day.

She was receiving steroids (dexamethasone 4 mg i.v. at 6 hour intervals) during and after the operation till her death. Angiography just prior to her death showed a complete block of the basilar artery just beyond its origin.
death revealed complete basilar artery block (Fig. 3). The other arteries were normal. Sections of the adequately fixed brain confirmed total basilar artery thrombosis with brainstem infarcts. Histological studies showed fungal hyphae within the wall of the basilar artery with intraluminal thrombus (Fig. 4). Postmortem examination of other organs, blood vessels, and paranasal sinuses revealed no abnormality.

**Discussion**

*Aspergillus* fungal spores are commensal in the respiratory tract and external auditory canal. Maxillary sinusitis of dental origin or the lungs are the most common sites of primary *Aspergillus* infection. Disseminated aspergillosis is more common in an immunocompromised host as an opportunistic infection. Intracranial spread of *Aspergillus* fungal infection occurs more frequently through hematogenous and less frequently through direct or contiguous spread. Direct infiltration into the basal bones leads to the more commonly encountered skull basal osteomyelitis. Intracranial infection can affect the parenchyma or the meninges. According to the site and nature of infection, the patient may present with features of meningitis, focal neurological signs or symptoms of raised intracranial pressure. The cerebral vasculature can be involved by mycotic aneurysms or intra-arterial thrombosis. *Aspergillus* hyphae can invade directly into the vessel wall which becomes weakened due to necrosis and polymorphonuclear infiltration, resulting in mycotic aneurysm formation. These aneurysms can burst and present with typical subarachnoid hemorrhage syndrome. Intraluminal extension of the hyphae can also initiate thrombus formation. Rarely, major arterial stenosis may occur following leptomeningeal infection. Steroids can inhibit the macrophage response to intracellular fungus and may permit enhanced germination. *Aspergillus* cultured optimally on Sabouraud’s agar demonstrates characteristic conidiophores. However, blood and cerebrospinal fluid cultures, even in disseminated disease, are frequently negative. Histological examination using HE, periodic acid-Schiff, or GMS staining shows characteristic branching septate hyphae and conidia. Immunoassay may detect the disease early but these tests are rarely done. The pathology is characterized by necrosis and acute inflammatory response around areas of granuloma. Aspergillosis is generally treated with surgical debridement and antifungal agents. Amphotericin B, rifampicin, 5-fluoro-cytosine, miconazole, fluconazole, and itraconazole are agents of varying efficacy and systemic toxicity. Loposomal amphotericin B and interferon-gamma are undergoing trials. Surgical debridement enhances abscess penetration by removal of necrotic debris. Nasal sprays of amphotericin or itraconazole prevent colonization in patients at high risk. The prognosis for central nervous system aspergillosis is poor, with most reported cases being fatal.

Our patients had various unusual features, as both were relatively young and otherwise in good health with no immunocompromise or detectable primary source of fungal infection. The lesions simulated benign neoplasms in the radiological features and gross appearance during surgery. Such a presentation of an *Aspergillus* infection as a granuloma is rare. One lesion was located exclusively in the dural cover of the Meckel’s cave while the other was densely adhered to the lateral wall of the cavernous sinus. Neither of these extracerebral locations of *Aspergillus* granulomas has been recorded. The exact cause of the involvement of these sites could not be ascertained. Despite successful resection from relatively difficult sites, the postoperative recovery of both patients was marred by vascular events. Case 1 suffered arterial infarct 1 month after surgery when he was already receiving antifungal drugs. Case 2 died of complications due to intra-arterial thrombosis and fungal growth in the vessel wall. Cerebrospinal fluid examination was not carried out in these patients so dissemination of fungi in the cerebral spaces could not be ascertained. The stress of surgery and the use of steroids to control cerebral edema in the immediate postoperative phase may have been contributory factors in the fungal growth.

Our experience in these two patients suggests that...
the possibility of an ischemic event should be considered in the postoperative phase. High awareness of the possibilities of fungal infection on the basis of radiology or operative findings, avoidance of steroids, and early treatment with antifungal agents may help avoid such a vascular insult. The effect of surgery and antifungal agents on the ultimate clinical outcome of these formidable lesions remains unclear.

Acknowledgment

The authors acknowledge the support and encouragement of Dr. Sunil K. Pandya (K.E.M. Hospital). Dr. Naina Goel (K.E.M. Hospital) edited the manuscript.

References

3) Bodey GP, Glann AS: Central nervous system aspergillosis following steroidal therapy for allergic bronchopulmonary aspergillosis. Chest 103: 299-301, 1993

Address reprint requests to: A. Goel, M.Ch., Department of Neurosurgery, K.E.M. Hospital, Parel, Bombay 400 012, India.