Actinomycosis of the brain

Case report

HE CHEN-WEI

Department of Neurosurgery, Dangtu Hospital, Dangtu, Anhui, People’s Republic of China

A rare case of actinomycosis of the brain is reported. The patient recovered after surgical excision of the lesion and a prolonged course of antibiotic therapy. At follow-up examination 25 months later, the patient was in excellent health. Different types of actinomycotic infections of the central nervous system are reviewed and the diagnosis and treatment of this disease are discussed.

KEY WORDS: brain abscess • actinomycosis • Nocardia • infection

ACTINOMYCOTIC infection of the brain is unusual. In 1951, Maltby reviewed the literature, beginning with the first case of central nervous system (CNS) involvement reported in 1882 by Ponfick, and found a total of 132 cases. In 1964, Bolton and Ashenhurst added 18 more cases.

Actinomycosis of the CNS is extremely rare in China. We have found only one case in the Chinese literature that is available to us: Li Jian-zhai, et al., described a case of intracranial actinomycosis involvement in 1955. We are reporting a case of an actinomycotic brain abscess which was treated by complete excision, with excellent results.

Case Report

This 18-year-old man was admitted to the hospital on June 19, 1982, with a 1-year history of headache. During the previous 4 months the headache had become worse and was accompanied by vomiting.

Examination. There was no significant physical abnormality. Temperature was 37°C and the blood pressure was 120/70 mm Hg. Except for bilateral papilledema with hemorrhages, the neurological examination was normal. White blood cell (WBC) count was 7700/cu mm, with a differential count of 69% segmented cells and 31% lymphocytes. The hemoglobin was 13.3 gm%. Chest and skull roentgenograms were normal.

On the 5th and 9th hospital days, angiography and ventriculography demonstrated a space-occupying lesion in the left frontal area. The ventricular fluid was clear and colorless, with 560 WBC’s/cu mm. Analysis of the ventricular fluid revealed protein levels of 513 mg%, chloride 120 mEq/liter, and sugar 82.8 mg/100 ml. A diagnosis of left frontal brain abscess was considered.

Operation. A left frontal craniotomy was performed and a thick-walled abscess measuring 5 x 4 x 1.5 cm was found 5 cm below the cortex. The abscess was tapped and completely removed through a frontal transcortical incision.

Pathological Examination. The operative specimen was a thick-walled abscess, 5 cm in diameter (Fig. 1). Microscopic examination (Fig. 2) of the abscess wall revealed an inner zone of granulation tissue infiltrated by polymorphonuclear leukocytes, lymphocytes, plasma cells, and actinomycotic granules. Within the abscess there were a few aggregations of delicate Gram-positive filaments which stained slightly basophilic with hematoxylin and eosin (H & E) and terminated in eosin-staining Gram-negative enlargements. Pathological diagnosis was actinomycosis of the brain.

Postoperative Course. The patient tolerated the operation well and showed immediate and progressive improvement. On the 9th postoperative day his temperature increased to 39°C, and then ranged between 37.5° and 38.5°C. Three weeks postoperatively, temperature returned to normal.

Three months after the original surgery, ventricular drainage was performed for obstructive hydrocephalus through the operative site in the frontal area. Approxi-
FIG. 2. Photomicrograph showing an actinomycotic granule with its compact arrangement of radiating filaments and peripheral enlargements. PAS, x 400.

FIG. 1. Photograph of the operative specimen which was a thick-walled abscess, measuring 5 x 4 x 1.5 cm.

approximately 270 ml of clear fluid was obtained, and analysis showed 2 WBC's/cu mm and a protein level of 21.4 mg%. Aerobic and anaerobic cultures failed to grow any organisms. Cranioplasty was followed 4 days later by placement of a ventriculocisternal shunt (Torkildsen's procedure). Postoperatively, the dysphasia and right mild weakness disappeared and vital signs returned to normal.

Beginning on the day of surgery, the patient was given 6,000,000 to 10,000,000 U/24 hrs of penicillin intravenously for 36 days, and 800,000 U/12 hrs intramuscularly for 37 additional days; he also received sulfadiazine, 4 gm/24 hrs intravenously for 36 days. Clinical recovery appeared complete, and the patient was discharged 134 days after admission. Penicillin was given for 32 days after discharge. When last seen, 25 months after excision of the actinomycoma, the patient had no complaints and remained without neurological deficit.

Discussion

An apparent cure of an actinomycotic brain abscess is described through the use of surgical excision and antibiotic therapy. The disease is caused mainly by *Actinomyces israelii*. In 1878, Israel described the first case of actinomycosis in man. Ponfick first described actinomycosis of the brain in 1882 when he reported two cases. In 1937, Friedman and Levy collected 108 cases from the literature. Cope reported a series of 1330 actinomycosis cases in 95% of which the disease was primarily located in the cervicofacial, thoracic, and abdominal areas. Of these, 10 patients had isolated involvement of the brain. The incidence of cranial involvement is small, being only about 5% to 8%. After an extensive review of our literature we found that only one case of this rare disease had been reported in China.

The intracranial disease is characterized by the following features: 1) There are no typical symptoms or signs. 2) The pathological processes may be divided into two types: localized or diffuse. The localized type appears in the form of an abscess or neoplasm-like collection. The abscess or granuloma is usually single. Orr reported seven cases that presented as tumors of the third ventricle. The bacteriological diagnosis of actinomycosis in these cases was based on the histological findings. The diffuse type of presentation manifests as meningitis and/or extradural involvement, with or without concomitant abscess formation. This is the most common type of CNS involvement. 3) The meningitis is most often basilar and purulent, with a predilection for the areas around the sella turcica and pituitary gland. 4) Invasion of the CNS may be hematogenous or by direct extension, usually from the infection in face, jaw, ear, nose, or paranasal sinuses. The extension generally progresses along connective tissue planes and through the foramina at the base of the skull. Another portal of entry may be the perineural spaces around the olfactory nerves, or along the branches of the fifth cranial nerve. Hematogenous metastatic spread is extremely uncommon. Snoke believed that the lymphatic route is important in the spread of the disease. No primary lesion was found in our case.

A definite diagnosis is possible when anaerobic cultures of cerebrospinal fluid or the brain-abscess contents yield colonies of typical *Actinomyces* organisms. Microscopic demonstration of classic actinomycotic granules with their compact arrangement of radiating filaments staining positive with Gram, H & E, or periodic acid-Schiff, and peripheral eosinophilic, Gram-
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<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Differentiating features of Actinomyces and Nocardia organisms</th>
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<tbody>
<tr>
<td>Actinomyces</td>
<td>Nocardia</td>
</tr>
<tr>
<td>natural habitat in the human oral cavity</td>
<td>free in nature</td>
</tr>
<tr>
<td>microaerophilic or anaerobic</td>
<td>aerobic</td>
</tr>
<tr>
<td>not acid-fast</td>
<td>acid-fast</td>
</tr>
<tr>
<td>filaments stain basophilic, terminate in eosinophilic “clubs” with hematoxylin and eosin stain</td>
<td>does not stain</td>
</tr>
<tr>
<td>difficult to produce infections in laboratory animals</td>
<td>experimental animals easily infected</td>
</tr>
</tbody>
</table>

Negative enlargements in the inner zone of granulation tissue of the abscess wall is also revealing. Occasionally, an angiogram demonstrates irregular narrowing of the carotid siphon and proximal parts of the anterior and middle cerebral arteries in intracranial actinomycosis. Nocardia organisms are frequently confused with Actinomyces, and the differential features are listed in Table 1.

The best treatment of localized abscesses or granulomas is a combination of complete surgical excision and a prolonged course of antibiotic therapy. Patients with diffuse actinomycosis or isolated meningitis can recover completely after penicillin treatment. At present, penicillin is the drug of choice in the treatment of this disease, and large doses should be given over prolonged periods. The dosage and duration of treatment are determined by the severity of the disease, but at least 3 to 4 months are usually required to eradicate the organism. Other drugs have proved effective, including lincomycin, tetracycline, oxytetracycline, chloramphenicol, erythromycin. Complete recovery occurred in this case after surgical excision of the lesion, with sufficient and prolonged antibiotic therapy. Follow-up examination at 25 months confirmed a satisfactory outcome.

References


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Address reprint requests to: He Chen-wei, Chief, Department of Neurosurgery, Dangtu Hospital 86-13, Dangtu, Anhui, People’s Republic of China.