ORIGINAL ARTICLE

Actinomycotic brain abscess successfully treated by burr hole aspiration and short course antimicrobial therapy

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Abstract
Three cases of brain abscess caused by Actinomyces israelii are reported which were successfully treated by burr hole aspiration and a short course of antibiotics (3–4 weeks). The clinical response of the patients, as well as the serial serum C-reactive protein levels and CT findings were used as a guideline for stopping antimicrobial therapy relatively early.

Key words: Actinomyces israelii, actinomycosis, antibiotics, brain abscess, C-reactive protein.

Introduction
It is recognized that the brain is involved in 1–15% of all actinomycotic infections and that Actinomyces israelii is the commonest infective pathogen of this group in man.1–5 Brain abscess caused by Actinomyces israelii, though recognized for more than a century,4 is rare and accounts for under 2% of all brain abscesses,1,5,6 with only 160 cases reported in the literature up to 1964.2,7,8 Reports of recent brain abscess series, however, suggest that this pathogen is being isolated more frequently.9

The treatment of actinomycotic brain abscess, since the first successfully treated case reported by Schneider and Rand in 1949,10 has been by surgery (excision or aspiration) and antimicrobial therapy which was maintained for an empirical period ranging from 2 to 6 months in most reports.1–5,11–13 More recently, Dailey et al. successfully treated a case of actinomycotic brain abscess by antibiotics alone after needle aspiration of the lesion to confirm the diagnosis. In this paper, the authors question the need for prolonged antimicrobial treatment for such patients after the appropriate surgical intervention. We report three cases of actinomycotic brain abscess which were treated by burr hole aspiration and a short course of antibiotics. The clinical response of the patients, as well as the serial CT scans and serum C reactive protein (CRP) findings were used as a guideline for stopping antibiotic therapy relatively early.

Patient details
Over the last decade three patients with a brain abscess caused by Actinomyces israelii were treated in our hospital. The clinical characteristics of the cases appear in Table I (Figs 1–3). The duration of symptoms ranged from 1 to 2 weeks for all cases. The three patients presented with features of raised intracranial...
<table>
<thead>
<tr>
<th>Case no.</th>
<th>Age (years)</th>
<th>Sex</th>
<th>1° source of infection</th>
<th>Location</th>
<th>Admission GCS</th>
<th>Duration of treatment (weeks)</th>
<th>Duration of follow-up (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>47</td>
<td>M</td>
<td>Unknown</td>
<td>Temporal (Fig. 1)</td>
<td>8</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>39</td>
<td>F</td>
<td>Congenital heart disease</td>
<td>Parieto-occipital (Fig. 2)</td>
<td>10</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td>M</td>
<td>Orogenic</td>
<td>Cerebellar (Fig. 3)</td>
<td>10</td>
<td>4</td>
<td>6</td>
</tr>
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pressure and focal deficits which corresponded with the location of the abscess. Two patients were febrile on admission (Cases 1 and 2), while one patient (Case 1) had focal epilepsy at presentation. All patients had emergency burr hole aspiration of the abscess. Serum CRP was measured by latex agglutination test, at presentation and at regular intervals until it returned to normality in all patients (Fig. 4). All patients initially received broad spectrum antibiotics (ceftriaxone, flucloxacillin and metronidazole). The treatment was changed to benzyl penicillin 2 mega units 4-hourly intravenously once the culture confirmed the growth of Actinomyces israelii (Fig. 5). The recovery was uneventful for Cases 2 and 3. Case 1 required a repeat aspiration 3 days after the initial surgery as there was evidence of recollection of the abscess on the repeat CT scan. Case 3 had a radical mastoidectomy 1 week after his cranial surgery. Ultimately, the follow-up CT scans for all patients showed reduction of the size and then disappearance of the abscess which corresponded well with the return of the serum CRP to normality and improvement of the patients' clinical condition. Treatment with benzyl penicillin was maintained for 3–4 weeks. The three patients made a good recovery returning to normality and there has been no evidence of any recurrence at a follow up ranging from 6 to 36 months.

Discussion

Actinomyces israelii is a higher microorganism characterized by Gram-positive non-acid-fast filamentous organisms with anaerobic requirements. It is part of the normal commensal flora of the mouth and gut. Its prokaryotic ultrastructure and mycelial pattern of growth places it between the classical bacteria and higher fungi. The pathogen is often confused with the aerobic acid-fast nocardia organisms; however, in all the cases reported here the actinomyces subspecies were isolated in culture.

Actinomycotic infection of the central nervous system (CNS) can be localized in the
form of brain abscess, granuloma (actinomyctoma), subdural or extradural abscess or diffuse in the form of meningitis or a mixture of these. In most cases, the disease spreads to the CNS from an extracranial primary focus, commonly the lungs, craniovascular area or abdomen. Recognized risk factors include: dental caries, recent tooth extraction, head trauma, gastrointestinal surgery, chronic mastoiditis sinusitis, tetralogy of Fallot, infection of an intrauterine device, alcoholism and poor pulmonary function. There are, however, cases without an apparent primary source of infection, although some authorities doubt that this is possible. In the three cases reported here, the *Actinomyces israelii* produced solitary brain abscesses. The infection was caused by a primary ear infection in one case, was related to congenital heart disease in another case, while the primary focus was not apparent in one case.

The traditional treatment of actinomycotic brain abscess has been by surgery and antimicrobial therapy. In the literature, there are more reports that recommend the excision of these abscesses than aspiration; however, both treatment options remain an acceptable practice. Benzyl penicillin is still the drug of choice in the treatment of actinomycotic brain abscess and to date most reports recommend the use of this antibiotic for a period ranging from 2 to 6 months. In this report the authors elected to treat the patients by burr hole aspiration and benzyl penicillin for a relatively shorter period of time.
FIG. 5. Branching filaments of *Actinomyces israelii* in aspirated pus from brain abscess of Case 2. (Silver stain, ×400.)

which was based on the clinical response of the patients, the return of serum CRP to normality and evidence of resolution of the abscess on CT.

CRP is an acute phase protein which can be measured in the serum quickly and accurately. It has a serum concentration of <10 mg/l in healthy individuals and is elevated in response to tissue injury, inflammation or infection. When the stimulus is removed the CRP concentration falls rapidly.\(^1\) In 1991, Jamjoom et al.\(^{19}\) reported a series of 12 patients with bacterial brain abscess who had there CRP monitored during treatment and found it to be useful in judging the effectiveness of treatment. None of the cases studied in that series had a brain abscess caused by *Actinomyces israelii*. In this report of three cases with abscess caused by this pathogen, the CRP was also found to be a sensitive indicator of the activity of the intracranial infection. There was a good correlation between the return of CRP to normality and improvement in the patient's clinical condition and the resolution of abscess on CT.

Actinomycotic brain abscess is a serious condition which still carries a mortality rate of 15–42%.\(^{1,3,12}\) A favourable outcome is likely to be achieved by early diagnosis with early surgical intervention, as well as providing the effective antimicrobial treatment and treating the primary focus. Serum CRP monitoring is a useful additional measurement which will help the clinician to assess the response to treatment.

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**References**

