

# Cranial Actinomycosis

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## ABSTRACT

**A 67-year-old man presented with actinomycotic osteomyelitis of the skull and underlying central nervous system (CNS) involvement. The computed tomography (CT) and magnetic resonance imaging (MRI) findings are discussed and the radiological literature is reviewed.**

**Keywords:** cranial, actinomycosis, MR

## CASE REPORT

We present a case of a 67-year-old man with a 2-week history of fever, numbness of the right side of the body, focal scalp tenderness and a one day history of focal convulsions. There was no past medical history of note except for pulmonary tuberculosis 30 years prior to admission. Physical examination was normal apart from a low grade pyrexia of 37.5°C. There was no evidence of infection elsewhere. Examination of the cerebrospinal fluid revealed raised protein and pleocytosis with 90% lymphocytes. Computed tomography revealed effacement of the sulci over the left parietal lobe. T1-weighted MR images demonstrated a small local area of osteomyelitis in the central skull vault adjacent to the sagittal sinus which was of intermediate signal (Fig 1a) and revealed enhancement after gadolinium (Fig 1b). The T1-weighted images revealed a subdural empyema which was seen as crescentic and lentiform fluid collections over the convexity of the brain which were of slightly more hyperintense signal than the normal CSF on T1-weighted images and demonstrated an enhancing margin after gadolinium (Fig 2). The subdural collection extended over almost the entire left cerebrum and extended into the interhemispheric fissure. The full extent was only appreciated on the T2-weighted images with suppression of the signal from CSF using the FLAIR sequence (fluid attenuation inversion recovery) (Fig 3). This sequence also revealed extension of the infection into the subarachnoid space and pial membrane (Fig 3). Craniotomy revealed a small subdural empyema from which branching gram positive rods of the actinomycosis were isolated. Intravenous penicillin G was commenced and the patient made a full recovery.

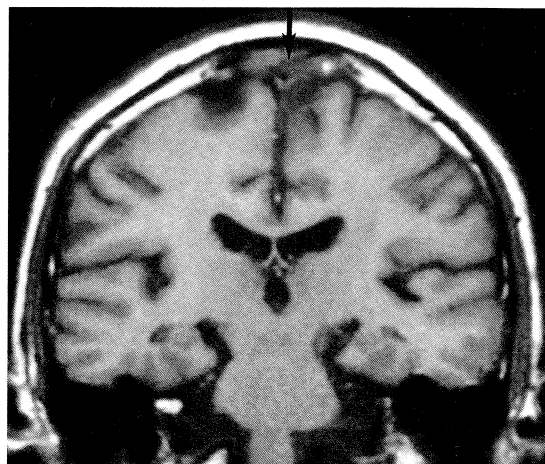


Fig 1a

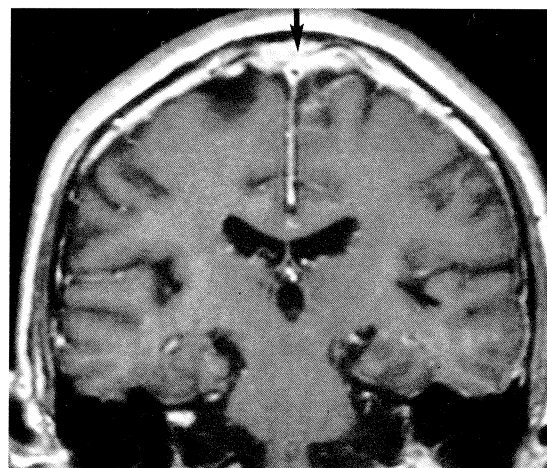


Fig 1b

**Fig 1a & b** – T1-weighted coronal MR image of the cranium demonstrating a focal area of osteomyelitis (arrow) on the pre-contrast scan (a) which enhances following contrast (b).

## DISCUSSION

Actinomyces species are a normal commensal of the oral, abdominal and pelvic cavity<sup>(1)</sup>. Actinomycosis arises in the immunocompetent patient following local trauma or another bacterial infection in one of these regions. Actinomycosis of the central nervous system is therefore rare<sup>(1)</sup> and actinomycotic osteomyelitis of the skull with underlying CNS involvement is even more uncommon with only three previously reported cases<sup>(2-4)</sup>. Spread to the central nervous system is thought to occur via direct invasion from the head

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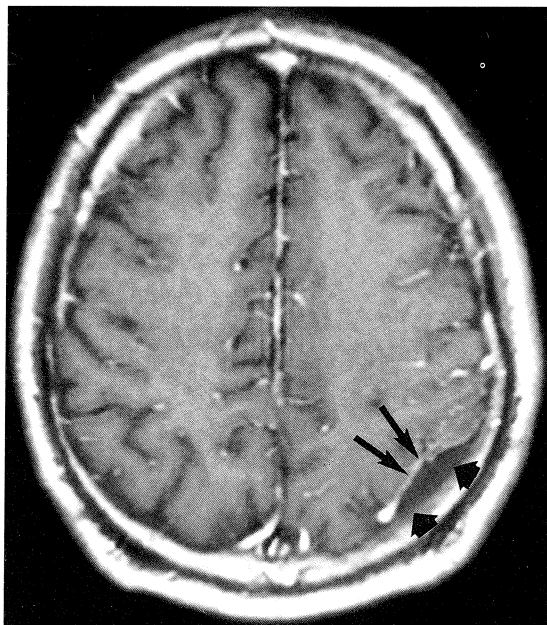
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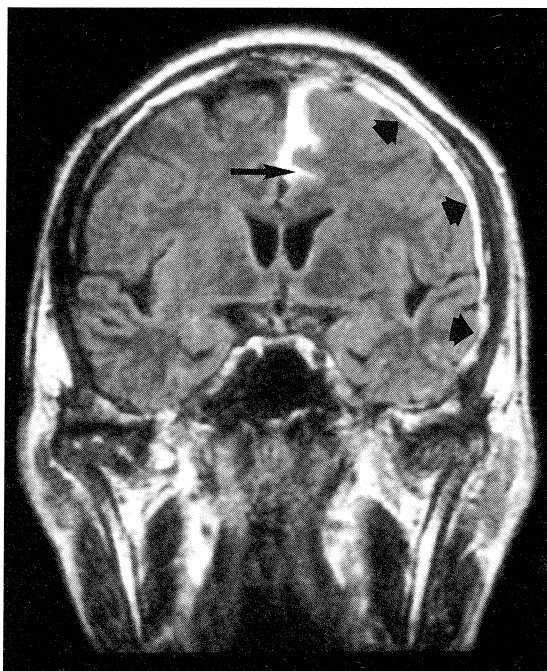
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**Fig 2** – T1-weighted axial MR image following contrast demonstrating a small lentiform subdural empyema (arrow heads) with a thin enhancing curvilinear margin adjacent to the brain (arrows).



**Fig 3** – T2-weighted coronal section with suppression of the signal from CSF (FLAIR) highlights the extent of the subdural empyema (arrow heads). Inflammatory change also extends into the subarachnoid space and pial layer (arrow).

and neck including the jaw, ears and paranasal sinuses or along fascial planes and neural foraminae<sup>(1)</sup>. Haematogenous spread may also occur from the chest and abdomen. Symptoms of cranial infection are frequently of long duration and fever is commonly absent<sup>(1)</sup>. Actinomycosis of the brain causes a brain abscess (67%), meningitis/meningoencephalitis (13%) or actinomycoma (7%)<sup>(1)</sup>. Subdural empyema and epidural empyema occur in 6% of cases<sup>(1)</sup>. As a result of the infrequent involvement of the CNS, the radiological features of this infection have been described in only a few cases. Cerebral or cerebellar abscesses, which are solitary or multiple with homogeneous or thick walled rim enhancement and surrounding oedema<sup>(1,5-7)</sup>, and an intracranial solid enhancing actinomycoma<sup>(4)</sup>, have been described on CT. MR imaging has shown enhancement in the cavernous sinus and internal auditory canal in a patient with acute purulent meningitis<sup>(8)</sup>, an enhancing suprasellar mass in a patient with an optic chiasm granuloma<sup>(9)</sup>, and a rim enhancing mass with a cystic component and oedema in a patient with an abscess<sup>(10)</sup>.

Actinomycotic osteomyelitis of the skull has been previously described in association with a subdural empyema<sup>(2)</sup>, epidural empyema<sup>(3)</sup> and an intracranial granuloma<sup>(4)</sup>. This is the third reported case of actinomycotic osteomyelitis with involvement of the underlying extracerebral space. MR imaging demonstrated features of infection which crossed compartments to involve the skull vault, subdural space and pial membrane. The signal intensity of the subdural collection was consistent with proteinaceous fluid and after contrast the more lentiform areas showed a thin margin of curvilinear enhancement adjacent to the brain confirming an empyema. The subdural empyema was identified on all sequences but the full extent could only be appreciated on the FLAIR sequence. On the T2-weighted sequence, the collection was of similar or slightly higher signal to the normal hyperintense CSF and therefore suppression of the signal from normal CSF using the FLAIR sequence improved conspicuity (Fig 4a & b). This also enabled the identification of inflammatory change extending into the adjacent sulci. Even after contrast enhancement, the full extent of the subdural collection could not be appreciated (Fig 4c). We therefore suggest that a T2-weighted sequence which utilises suppression of the CSF signal should be added to the routine protocol in cases of suspected infection in the extracerebral space.

In conclusion, actinomycosis of the CNS should be considered in patients with a history of actinomycosis in the oral cavity, abdomen or thorax who present with a long duration of neurological symptoms with or without an accompanying fever. Imaging demonstrates evidence of infection in the form of a cerebral abscess, meningitis, subdural/epidural empyema or osteomyelitis of the skull. However, there are no imaging features to point to actinomycosis as the specific cause for infection. In an atypical clinical presentation, in which there is an abrupt onset of symptoms and no evidence of

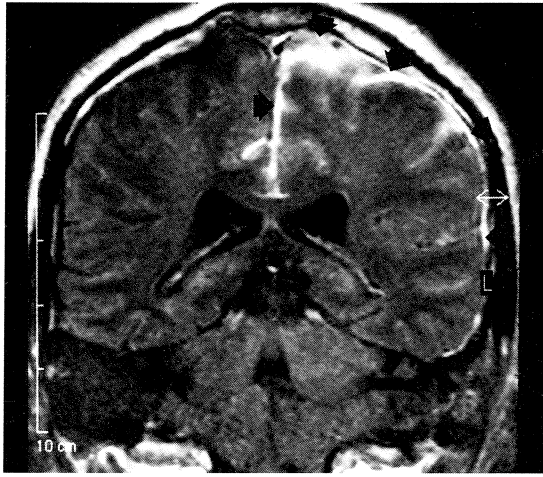


Fig 4a

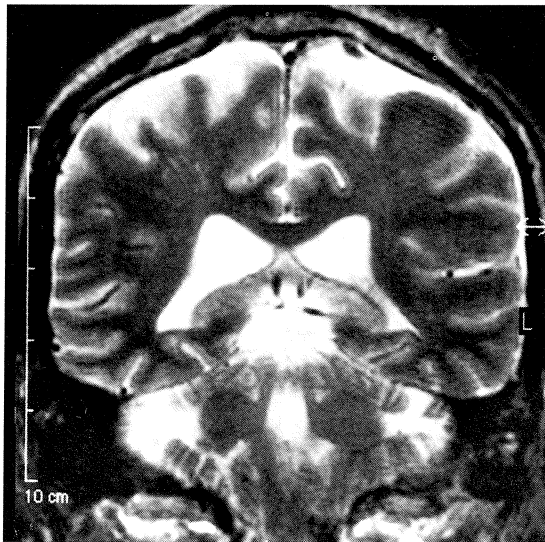


Fig 4b

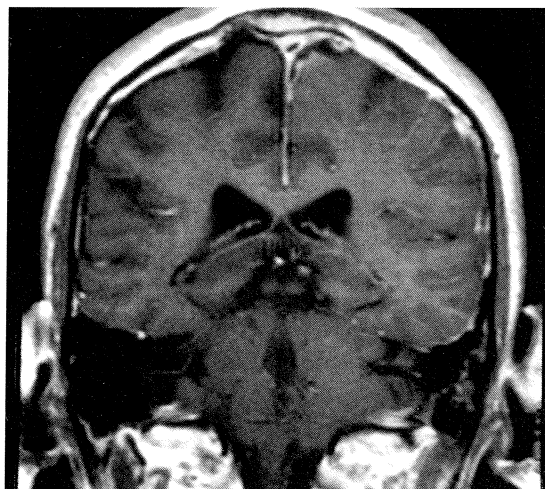


Fig 4c

**Fig 4a, b & c** – Coronal MR image clearly demonstrates the extent of the subdural collection over the convexity of the brain and along the interhemispheric fissure (arrow heads) on the FLAIR sequence (a) but is poorly demonstrated on the T2-weighted image (b) and the contrast-enhanced T1-weighted image (c).

infection elsewhere, the diagnosis will be overlooked unless pathological specimens are routinely examined for the organism.

#### REFERENCES

1. Smego RA. Actinomycosis of the central nervous system. *Rev Infect Dis* 1987; 9:855-65.
2. Jewes LA, Laing RJ. Acute actinomycotic osteomyelitis of the skull with subdural empyema. *J Infect* 1990; 20:266-7.
3. Kirsch WM, Skeys JC. Actinomycotic osteomyelitis of the skull and epidural space. *J Neurol* 1970; 33:347-51.
4. Khosla VK, Banerjee AK, Chopra JS. Intracranial actinomycoma with osteomyelitis simulating a meningioma. *J Neurosurg* 1984; 60:204-7.
5. Sharma BS, Banerjee AK, Sobti MK, Kak VK. Actinomycotic brain abscess. *Clin Neurol Neurosurg* 1990; 92:373-6.
6. Donald FE, Firth JL, Holland IM, Hope DT, Ispahani P, Punt JA. Brain abscess in the 1980s. *Br J Neurosurg* 1990; 4:265-71.
7. Jamjoom AB, Jamjoom ZA, al-Hedaithy SS. Actinomycotic brain abscess successfully treated by burr hole aspiration and short course antimicrobial therapy. *Br J Neurosurg* 1994; 8:545-50.
8. Funaki B, Rosenblum JD. MR of central nervous system actinomycosis (letter). *AJNR Am J Neuroradiol* 1995; 16:1179-80.
9. Toyoda O, Nojiri, Nakajima H. Actinomycotic granuloma of the optic chiasma: a case report. *No Shinkei Geka* 1993; 21:623-7.
10. Krishna L, Slizofski WJ, Katsetos CD, et al. Abnormal intracerebral thallium localization in a bacterial brain abscess. *J Nucl Med* 1992; 33:2017-9.