

## Intracranial tuberculoma – a diagnostic dilemma

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### Abstract

The characteristics of intracranial tuberculoma on computed tomography (CT) and magnetic resonance imaging (MRI) are not well known. The authors present a patient with an intracranial tuberculoma in whom the diagnosis was confirmed only after surgical excision.

**Key words:** Intracranial Tuberculoma; Magnetic Resonance Imaging; Computed Tomography

### Introduction

Intracranial tuberculoma is a rarity in developed countries. It is a curable lesion and responds well to medical treatment. The great polymorphism of the computed tomography (CT) and the magnetic resonance imaging (MRI) appearance of intracranial tuberculoma allows it to mimic other types of intracranial masses. A patient is presented with an intracranial tuberculoma which CT led us to believe could be an encephalocoele and the MRI suggested it to be possibly a malignant tumour. It was only after the resection of the lesion that the diagnosis of the tuberculoma was confirmed.

### Case report

A 15-year-old boy of Indian origin but who had been living in Ireland for five years presented with a history of intermittent right frontal headache of a year's duration. It was worse in the mornings, and was also exacerbated on coughing. It was relieved on lying flat. The interval between the attacks had shortened over the preceding couple of months. These were associated with photophobia but there was no nausea or vomiting. He denied any history of fever, sweats or weight loss. His father and brother both had tuberculous cervical cold abscess about five years previously.

Neurological examination was normal except fundoscopy revealed bilateral papilloedema. ENT examination was normal.

A full blood count and blood urea and electrolytes were normal. Erythrocyte sedimentation rate was 4 mm/hour. The chest X-ray was normal. CT scan of the sinuses and the brain revealed an apparent encephalocoele involving the right side of the frontal sinus (Figure 1). Part of the cribriform plate also appeared to be deficient. No significant sinus disease was seen. MRI scan showed a 3.7 cm lobulated mass arising within the anterior cranial fossa and extending superiorly from the cribriform plate and olfactory groove with extensive surrounding oedema and mass effect. The lesion enhanced avidly following the

administration of intravenous gadolinium. There was a plane of separation seen between the mass and the ethmoid air-cells (Figure 2).

Bifrontal craniotomy was done and complete excision of the frontal lobe lesion was carried out. Histological examination revealed the overall appearance of a necrotizing granulomatous process with caseous necrosis consistent with tuberculous infection. There was no evidence of any neoplastic process.

The patient was seen in the infectious disease department and started on a four-drug anti-tuberculous therapy (rifampicin, isoniazid, ethambutol and pyrazinamide) given the country of origin of the patient and his father. At present the regimen has been reduced to a two-drug therapy. The patient has responded very well to the surgery and medical treatment and is living a normal life.

### Discussion

Tuberculosis kills 1.8 million people in the world each year and presents a massive infectious disease problem in the developing world together with HIV, AIDS and malaria.<sup>1</sup> The first Bills of Mortality of the City of Dublin provided evidence that tuberculosis was prevalent in Dublin and that it was the major cause of death in the 17th and 18th centuries.<sup>2</sup> Tuberculosis was a major health problem in the Republic of Ireland in the 1950s and in the previous decades. The scenario has changed but tuberculosis has not gone away.<sup>1</sup> The rise in cases from the beginning of the 19th century continued to its end and then began a decline, which with minor fluctuations has continued throughout the 20th century.<sup>2</sup> The total number of new cases recorded in the year 2001 was 381 and only five deaths were attributed to tuberculosis. Sixty-three cases (16.5 per cent) were born outside Ireland.<sup>3</sup>

Tuberculosis is an airborne disease caused by the bacterium *Mycobacterium tuberculosis*. Intracranial tuberculoma results from haematogenous spread from a primary focus, which is usually in the lung. It is often not visible on a chest radiograph.<sup>4</sup> Tuberculoma can present at

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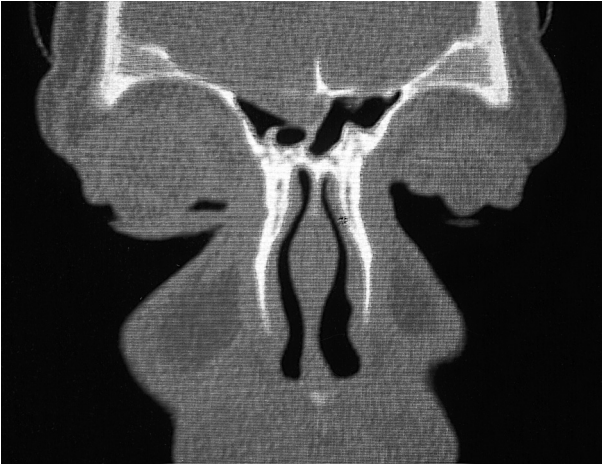


FIG. 1

Computed tomography (CT) scan of sinuses showing an apparent encephalocele involving the right side of the frontal sinus. Part of the cribriform plate also appears to be deficient.

any age, but Arseni reported half of the cases to be under the age of 20.<sup>5</sup> The patient may present either with focal epilepsy with or without raised intracranial pressure or with signs and symptoms of an expanding intracranial mass.<sup>6</sup> Our patient presented with an intractable headache that was due to the expanding mass. Papilloedema is present in most of the cases of intracranial tuberculoma<sup>7</sup> and so was the finding in this case.

- **This case report describes an intracranial tuberculoma presenting in the anterior skull base**
- **The radiological characteristics of this condition are discussed**

The characteristics of intracranial tuberculoma on CT and MRI are not well known. Although the sensitivity of CT in diagnosing intracranial tuberculoma is 100 per cent and its specificity is 86 per cent, the positive predictive value has been reported to be as low as 33 per cent even in a high incidence population in India.<sup>8</sup> The great polymorphism of the CT appearance of intracranial tuberculomas allows it to mimic possibly any other type of lesion. The CT appearance is non-specific and differential considerations include both neoplasia and other inflammatory processes.<sup>9</sup> This was evident in the presented case, the CT without contrast was suggestive of an encephalocele. There is no CT finding that is absolutely diagnostic of an intracranial tuberculoma. The diagnosis is therefore, presumptive and based on all supportive clinical data.<sup>10</sup> The notable manifestations of the CT finding is isodense to hypodense with enhancement on contrast. The enhancement may be a ring, nodular or disc type. Multiple lesions of probably different characteristics occurring in the same patient have been seen in 15–20 per cent.<sup>6</sup>

The MRI signal characteristics of intracranial tuberculoma are extremely diverse. An isointense or hypointense core with a hyperintense rim on T2-weighted and fluid-attenuated inversion recovery (FLAIR) images is the most common presentation.<sup>11</sup> Jinkins *et al.* reported that MR features of the individual tuberculoma depend on whether the granuloma is non-caseating, caseating with a solid centre, or caseating with a liquid centre.<sup>12</sup>



FIG. 2

Magnetic resonance imaging (MRI) scan showing a 3.7 cm lobulated mass arising within the anterior cranial fossa and extending superiorly from the cribriform plate and olfactory groove with extensive surrounding oedema and mass effect. The lesion enhanced avidly following the administration of intravenous gadolinium. There is a plane of separation seen between the mass and the ethmoid air-cells.

Clinically and radiologically, therefore, a tuberculoma can be indistinguishable from other intracranial space-occupying lesions. When diagnosis is uncertain, histology is mandatory to differentiate a tuberculoma from other infectious or neoplastic disease.<sup>13</sup>

Empirical anti-tuberculous therapy is often used in countries where tuberculosis is endemic, biopsy being reserved for cases where the lesion fails to respond.<sup>14</sup> The recommended duration of anti-tuberculous therapy for intracranial tuberculoma is nine to 18 months.<sup>15</sup>

Tuberculoma has not gone away.<sup>1</sup> In developed countries, due to the rarity of the condition and a large number of emigrants from the countries where tuberculosis is prevalent, a high index of suspicion should be maintained and diagnostic criteria looked for to make the proper diagnosis prior to surgery.

## References

- 1 Bredin CP. Tuberculosis in the Ireland of 2003: It hasn't gone away. *Ir Med J* 2004;**97**:6–7
- 2 Smith A, Igoe D, O'Flanagan D. Tuberculosis in the Republic of Ireland at the end of the 1990s. *Ir Med J* 2002;**95**:136–9
- 3 *Tuberculosis in Ireland, 2001*. National Disease Surveillance Centre Annual Report. Dublin, 2002
- 4 Whelan MA, Stern J. Intracranial tuberculoma. *Radiology* 1981;**138**:75–81
- 5 Arseni C. Two hundred and one cases of intracranial tuberculoma treated surgically. *J Neurol Neurosurg Psychiatry* 1958;**21**:308–11
- 6 Bhargava S, Tondon PN. Intracranial tuberculomas: a CT study. *Br J Radiol* 1980;**53**:935–45

- 7 Dastur HM, Desai AD. A comparative study of brain tuberculomas and gliomas. *Brain* 1965;**88**:375–96
- 8 Selvapandian S, Rajshekhar V, Chandy MJ, Idikula J. Predictive value of computed tomography-based diagnosis of intracranial tuberculomas. *Neurosurgery* 1994;**35**:845–50
- 9 Jinkins JR. Computed tomography of intracranial tuberculosis. *Neuroradiology* 1991;**33**:126–35
- 10 Vengsarkar US, Pisipaty RP, Parekh B, Panchal VG, Shetty MN. Intracranial tuberculoma and the CT scan. *J Neurosurg* 1986;**64**:568–74
- 11 Wasay M, Kheleani BA, Moolani MK, Zaheer J, Pui M, Hasan S, *et al.* Brain CT and MRI findings in 100 consecutive patients with intracranial tuberculoma. *J Neuroimaging* 2003;**13**:240–7
- 12 Jinkins JR, Gupta R, Chang KH. MR imaging of central nervous system tuberculosis. *Radiol Clin North Am* 1995;**33**:771–86
- 13 Lee WY, Pang KY, Wong CK. Brain tuberculoma in Hong Kong. *Hong Kong Med J* 2002;**8**:52–6
- 14 White A, Davies KG, Anwar S, Neal JW, Vafidis JA. Cerebral tuberculoma. *Br J Clin Path* 1994;**48**:222–3
- 15 Joint Tuberculosis Committee of the British Thoracic Society. Chemotherapy and management of tuberculosis in the United Kingdom: Recommendations. *Thorax* 1998;**53**:536–48

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Mr R K Tewary takes responsibility for the integrity of the content of the paper.

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