CLINICAL REVIEW

Tuberculomas of the brain in Britain

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Summary
Reports of three patients with tuberculomas of the brain are presented. The mode of presentation and clinical features of this condition are reviewed.

Introduction
Tuberculomas are granulomas of tuberculous origin which behaves as space-occupying lesions. In some tropical countries they are amongst the commonest of brain tumours, but in this country they have now become exceedingly rare. In one neurosurgical unit in this country only three cases have been seen in the last 21 years, out of a total of 2200 intracranial tumours. These three cases are described and the natural history and clinical features of the condition are discussed. Contrary to what might be expected, it is seldom that a tuberculoma of the brain can be diagnosed pre-operatively in this country, even if the possibility has been considered. Postoperatively, a long-term follow-up is desirable, as relapses of tuberculous infection can occur even after a long interval.

Case reports
Case 1
A 40-year-old housewife was admitted in August 1971. She gave a 5-month history of early morning headache, intermittent neck stiffness, and a feeling of unsteadiness when walking. In the last few weeks she had had difficulty in reading small print. There was no personal or family history of tuberculosis, and her weight and appetite had not changed.

On examination, she was alert and cheerful with normal mentation. She was apyrexial and her general appearance did not suggest ill-health. She had marked bilateral papilloedema with impairment of central acuity (VAR 6/24, VAL 6/60). There was unsustained nystagmus on gaze to the left and slight intention tremor and dysdiadokinesis in the left hand. On heel-toe walking she tended to stumble to the left.

Investigations. Hb 15·4 g/100 ml, white count 8500/mm³ and ESR 25 mm/hr. A chest X-ray was normal except for some calcification in the right hilar nodes. Skull X-rays were normal; in particular they showed no abnormal calcification. A brain-scan was suggestive of a posterior fossa space-occupying lesion. A right vertebral angiogram was then performed and this showed a completely avascular mass in the left cerebellar hemisphere. No pathological circulation was seen.

Operation. When the posterior fossa was explored, the left cerebellar hemisphere was found to be tense and expanded but its surface and the dura were normal. At 2 cm depth in the hemisphere a well demarcated nodular spherical reddish-grey tumour of 3–4 cm diameter was encountered and completely removed. It was rubbery in consistency and had no blood supply. When cut open it was found to consist of a rubbery capsule about 0·5–1 cm thick enclosing a yellow softish core which at the time was remarked upon as being cheesy in character. Histological examination showed 'granulomatous inflammatory tissue with many Langhans type giant cells and caseous necrosis typical of tuberculosis' (Dr L. W. Duchen). Acid-fast bacilli were not seen.

Postoperatively a course of isoniazid was commenced. During the immediate postoperative period there was a worsening of her left-sided ataxia and the ESR rose consistently to over 80 mm/hr, but these features rapidly improved over the next 3 weeks and her further postoperative recovery was uneventful. Eight months postoperatively she was free of symptoms and her only abnormal neurological sign was a minimal ataxia of the left hand.

Case 2
A 57-year-old waitress was admitted to hospital in August 1971 with a 3-month history of dementia. She had been sent home from work because of odd behaviour and later had been found wandering round her house at all hours, eating at unusual times and defaecating on the floor. There was no history of any illness of note in either herself or her family.
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On examination she was alert but was at times disorientated with a fatuous or tearful affect. She was dishevelled but did not look as if she had lost weight and she was afebrile. She had a right upper motor neurone type facial weakness, her tendon reflexes were symmetrically brisk, and both plantar responses were upgoing.

**Investigations.** Skull X-ray and chest X-ray were normal. Hb 13.0 g/100 ml, WBC 5700/mm³ and ESR 5 and 30 mm/hr on two separate occasions. A brain-scan suggested lesions in the left frontal and left parietal areas. Left carotid angiogram showed a large completely avascular mass in the front of the left frontal lobe. The Wasserman reaction was negative. Lumbar puncture revealed a pressure of 170 mm H₂O, no cells, protein of 250 mg/100 ml, chloride 28 mg/100 ml and glucose 36 mg/100 ml. She was strongly Mantoux-positive.

On exploration, the prefrontal area was found to be bulging and the cortex looked faintly discoloured as if by something beneath. At a depth of a few millimetres a rubbery well-demarcated reddish-grey mass 5 cm in diameter was encountered and was apparently completely removed. The dura and arachnoid over the frontal lobe were macroscopically normal. On section the tumour showed small areas of cheesy softening. Histological examination showed a chronic granuloma, almost certainly tuberculoid, although well marked giant cell systems were lacking (Dr S. Strich). Two acid-fast bacilli were seen.

Postoperatively she was started on a course of streptomycin, isoniazid and PAS and made a complete and uneventful recovery. Nine months later she remains in good health and has been back at work for 6 months.

**Case 3**

A 28-year-old clerk was admitted to hospital in May 1952 with a 4-week history of early morning headache and vomiting and a lump in the left side of her neck. At the age of 8 months she had had a laparotomy performed for what was said to be tuberculoid peritonitis. When aged 25 she had developed tuberculoid osteitis of her thoracic spine and during her convalescence from this she had developed headache, vomiting and diplopia which had been diagnosed as tuberculoid meningitis (although a lumbar puncture was not done) and which had successfully responded to antituberculous chemotherapy.

On examination she was afebrile and plump and looked healthy. She had bilateral papilloedema and inconstant nystagmus on gaze to either side. In the left anterior triangle of the neck was a slightly tender cool fluctuant swelling which was presumed to be a tuberculoid lymph node. Skull X-ray showed no abnormality and spinal X-rays showed old tuberculosis of thoracic vertebrae 5 to 7 without collapse. Lumbar puncture revealed a pressure of 360 mm H₂O, with no cells in the cerebrospinal fluid and a protein of 60 mg%. Air ventriculography showed a mass in the right cerebellar hemisphere.

On exploration, the extreme lateral part of the right cerebellar hemisphere was found to be adherent to the dura over a 1.5 cm diameter area. Beneath this was a firm reddish nodular tumour, well demarcated and 2.5–3 cm in diameter, lying in the lateral part of the hemisphere. On section it contained inside several soft whitish areas up to 4 mm in diameter. Histological examination showed central caseation surrounded by typical tuberculoid epithelioid and giant cell granulomatous systems. At one point the granulomatous process extended into the subarachnoid space. One acid-fast bacillus could be seen. Subsequent culture of the tumour material grew *Mycobacterium tuberculosis*.

Postoperatively she was given a 6-week course of intramuscular and intrathecal streptomycin and made an uneventful recovery. When discharged 8 weeks after the operation there were no residual neurological signs and her neck cold abscess had subsided without surgical treatment. Shortly before discharge her lumbar CSF revealed a protein of 30 mg/100 ml and no cells.

Subsequently she remained in good health for 10 years, but in 1962 she was re-admitted to hospital with tuberculoid meningitis which was successfully treated with streptomycin, isoniazid and PAS, the latter two drugs being continued for 3 years. Since then she has remained in good health and she now (1972) has no abnormal neurological signs.

**Discussion**

While tuberculomas of the brain are still common in many underdeveloped parts of the world, in western countries they are becoming increasingly rare. The three cases described above represent an incidence of 0.15% amongst the 2200 intracranial tumours seen at the Guy's-Maudsley Neurosurgical Unit from 1951 to 72. This appears to be the lowest incidence which has been reported anywhere in the world. It contrasts with an incidence of 1.6% in Cushing's series of brain tumours (Cushing, 1932), and 0.7% in a series from the Columbia Presbyterian Medical Centre from 1933–55 (Sibley & O'Brien, 1956). At the other extreme, incidences have been reported as high as 30.5% in India (Dastur & Desai, 1965), 19.9% in Chile (Asenjo, Valladares & Fierro, 1951) and 7.3% in Rumania (Arsenii, 1958).

Tuberculomas may occur anywhere in the central nervous system, although in the brain they tend to be supratentorial in adults and infratentorial in children (Mathai & Chandy, 1967). They occur much less often in the spinal cord, and Lin has estimated...
that for every fifty tuberculomas in the brain only one occurs in the cord (Lin, 1960).

They may occur at any period of life from infancy to old age, and the overall sex ratio is approximately equal. The greatest incidence is between the ages of 10 and 30, and a tendency to appear in women of child-bearing age has been attributed to a reactivation of tuberculosis by repeated pregnancies (Dastur & Desai, 1965). An alleged decreasing frequency of cases after the age of 30 is probably merely a reflection of the low expectation of life in those countries where tuberculomas are commonest.

Macroscopically, the three tumours described here were typical in appearance. They are usually firm, rubbery, well defined masses with nodular surfaces. The cut surface may show signs of cheesy necrosis and, in about 5%, patchy calcification may be seen (Arseni, 1958). In 6% the tuberculoma is mainly extracerebral with a wide attachment to the dura, thus resembling a meningioma (Dastur & Desia, 1965).

An apparently unique cystic tuberculoma of the cerebral hemisphere has been described (Dastur, Desai & Desai, 1962). Usually only a single tuberculoma is found. The reported incidence of two or more lesions varies from 2% (Mathai & Chandy, 1967) to 34% (Sibley & O'Brien, 1956).

Surprisingly, a personal or family history of tuberculosis is far from invariable. Arseni reported a past history of tuberculosis in 52% of his series of 201 cases (pulmonary in 43%) and a history of tuberculosis in the patients' family or close associates in 29% (Arseni, 1958). Concomitant tuberculosis elsewhere in the body is found in only one case in three (Ranamurthi & Varadarajan, 1961).

The clinical course of tuberculomas has no features distinguishing them from other space-occupying lesions of the brain. Dastur & Desai compared a series of tuberculomas with a matched series of gliomas (Dastur & Desai, 1965). Symptoms tended to be longer in gliomas but fever was not less striking than in tuberculomas, though in the latter it tended to occur over a longer period if it occurred at all. Our three cases were all afebrile and in good general health, without systemic manifestations of tuberculosis. This is in keeping with experience elsewhere. In Arseni's series, 32% were in good general health and only 15% showed marked impairment of general well-being. In the same series, there was a fever in only 10%, a raised ESR in only 15%, and fundal tuberculous lesions in only 1%. A hypochromic anaemia and a relative lymphocytosis were 'frequent'.

The Mantoux test is not necessarily positive and indeed in children is positive in only 25% (Arseni, 1958).

The investigations also do not permit a diagnosis from other tumours to be made. In all series the incidence of calcification visible on plain skull X-rays is 5% or less. Sutton (1962) points out that this is in marked contrast to the healed basal exudate of old tuberculous meningitis which is frequently calcified. Angiography shows an avascular space-occupying lesion, although occasionally superficial tumours show a low-grade vascularization (Ranamurthi & Varadarajan, 1961). In a few cases, a sudden reduction in blood vessel calibre near the lesion has been observed (Dastur & Desai, 1965).

In some cases, air and Myodil ventriculography has been used, but no special features suggestive of tuberculomas have been noted (Ranamurthi & Varadarajan, 1961).

In two of our three cases, the cerebrospinal fluid was examined. Apart from elevation of the protein level (slight in Case 3), no abnormality was noted. In most series, CSF findings have been not reported but Sibley & O'Brien (1956) report the pre-operative findings in eight cases. The cell counts were normal in six and showed a mild lymphocytosis in two cases. The protein was raised in seven cases (over 100 mg/100 ml in three) but the sugar was normal in the three cases tested.

The treatment of intracranial tuberculomas was revolutionized by the introduction of anti-tuberculous chemotherapy. Before that time, removal generally led to tuberculous meningitis, and so cases were treated with decompression alone. In one large series of cases, in the period before streptomycin was discovered, decompression had a mortality of only 34%, as compared with 85% if removal was attempted (Arseni, 1958). However, even with this palliative surgery of the pre-chemotherapy era, survivals of up to 19 years were recorded. The dramatic effect of the introduction of streptomycin is illustrated by the fact that in the same series of Arseni, radical surgery with streptomycin cover had a mortality of only 12% (6% immediate operative mortality, 6% late mortality from tuberculous meningitis).

There is no general agreement as to how long the chemotherapeutic regime should continue to or as to the length of time for which patients should be followed postoperatively. This is probably partly a reflection of the fact that this condition is only commonly encountered in those parts of the world where a prolonged course of treatment and follow-up are least practicable. Sibley & O'Brien (1956) state that postoperative meningitis is prevented by 10–90 days of postoperative streptomycin. Mathai & Chandy (1967) advise dusting the tumour bed with streptomycin after removal and say that tuberculous meningitis seldom occurs if this is done. They recommend the use of steroids if spillage occurs, to prevent meningeal adhesions, and also if there is considerable oedema surrounding the tuberculoma. They also suggest that anti-tuberculous chemo-
therapy should continue for at least a year post-operatively, while Dastur & Desai (1965) recommend not less than 18 months. Our experience with Case 3, where a relapse of tuberculous meningitis occurred 10 years after successful removal of a tuberculoma, suggests that anti-tuberculous chemotherapy for a long period is desirable.

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References


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