DIAGNOSIS OF TUBERCULOMAS OF THE BRAIN

CLINICAL AND RADIOLOGICAL CORRELATION*

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This paper is based upon experience gained in the treatment of about 175 tuberculomas of the brain in the Department of Neurosurgery, Madras Medical College. Tuberculomas of the brain formed about 20 per cent of the intracranial tumors dealt with in Madras. They form a good percentage of intracranial lesions dealt with in countries of Asia, Eastern Europe, Italy, Spain and South America. Since the advent of streptomycin, surgery has been of great benefit to these patients. Hence clinical and radiological diagnosis of tuberculomas of the brain are of practical importance to neurosurgeons.

It is not necessary to perform operation in every case of tuberculoma. Surgery is indicated only when there are signs of space-occupying lesions. If there is no evidence of pressure on the brain medical treatment is fully effective.

A preoperative diagnosis of tuberculoma of the brain is a presumptive diagnosis. When a patient presents focal neurological signs and evidence of increased intracranial pressure, investigation to exclude a tuberculoma is a routine procedure. This is essential in countries in which tuberculomas represent a good percentage of intracranial tumors. The patient is investigated for other evidence of tuberculous infection, such as adenitis (cervical or mediastinal), pleural effusion, active pulmonary lesion, involvement of bones or joints, renal tuberculosis, endometritis, etc. In more than 34 per cent of cases (59 out of 175) there was concomitant evidence of tuberculous infection. In another 36 per cent (64 out of 175) there was a previous history of tuberculosis in the patient or a history of contact with the infection.

The clinical features of a tuberculoma resemble those of other intracranial tumors. As tuberculomas are slow-growing the clinical picture is that of a slowly progressive lesion.

Clinical Examination. It has been our experience that patients who have a tuberculoma of the brain are of a better build, and look better nourished than those who have tuberculous meningitis. The fact that a patient obviously is healthy does not exclude the presence of a tuberculoma of the brain. It may be that the increased resistance of the patient prevented formation of widespread tubercular meningitis.

In our experience, patients with tuberculomas of the brain fall broadly into two groups. In the larger first group, the patients have signs of increased intracranial pressure with or without localizing neurological signs. This group is investigated as in any other case of intracranial space-occupying lesion. In the smaller second group, the patients exhibit progressive neurological disability without increased intracranial tension. There is definite evidence of tuberculous infection elsewhere in the body or a definite history of contact with tuberculosis, and the Mantoux test is positive. When treated with antituberculous drugs, the neurological signs recede. The patients do not show signs of increased intracranial tension for a long time after the onset of neurological signs. They seek treatment early because of the focal

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neurological deficit, and with medical treatment they show good improvement. Patient B.B.J. (NS 5720) gave a history of focal fits followed by progressive weakness of the left upper limb. There was no evidence of increased intracranial pressure but she had enlarged cervical glands which on biopsy proved to be tubercular. The patient was put on antituberculous treatment and phenobarbitone. She showed remarkable improvement and the enlargement of the cervical glands disappeared. The fits were controlled and the power in the limb improved though some residual weakness was present. Another patient (NS 6120) was admitted with progressive unilateral cerebellar symptoms without increased intracranial tension. He had an active tubercular lesion in the lung. With antibiotic therapy, the pulmonary lesion and the cerebellar symptoms cleared.

From the marked improvement resulting in the focal neurological condition, it is presumed that these patients had an infiltrating tuberculous process in the brain, which receded with antibiotics. Two of the patients in whom the intracranial pressure increased were operated upon and were found to have an infiltrating type of tuberculoma of the cortex and subcortex. Such lesions are different from those of the first group. The radiological features are discussed below. In such cases surgery is not indicated; it will lead only to a permanent neurological deficit, with no benefit to the patient.

The radiological investigation of tuberculomas of the brain has proved very interesting. Roentgenograms of the chest are taken routinely. In 14 per cent of the cases there was evidence of old or recent involvement of the lung, and in 11 per cent mediastinal adenitis was revealed. Roentgenograms of the skull also are taken routinely. Contradicting the popular idea that tuberculomas of the brain often show calcification, in only 11 out of 175 cases, i.e. 6 per cent, was there evidence of intracranial calcification in tuberculomas. Pineal shift frequently cannot be assessed by us as the pineal body does not calcify as often as reported in the literature of the West. Plain roentgenograms often show signs of increased intracranial tension as evidenced by marked digital impressions, separation of sutures, erosion of the posterior clinoid process or a deepening of the pituitary fossa (40 out of 200 cases, or 20 per cent).

When the lesion is diagnosed as supratentorial in location, carotid angiography is done. Tuberculomas of the brain usually are revealed as avascular lesions in the angiogram (Figs. 1 and 2). Depending on its size and location, the tuberculoma causes changes in the vascular patterns. When such an avascular lesion is seen, it is presumed to be either a tuberculoma or, rarely, a chronic abscess. Initially it was presumed that all tuberculomas were avascular. But experience has shown that some of them can show a mildly increased vascularity resembling a low-grade vascular meningioma (Figs. 3, 4 and 5).

The tuberculomas that show vascularity...
present certain features that distinguish them from those that are almost completely avascular. Avascular tumors are usually deep and subcortical; on the other hand, the vascular tuberculomas may be just subcortical or may prove to be infiltrating the cortex and the subcortex, without any line of demarcation. These infiltrating vascular tuberculomas of the cortex and the subcortex may not increase the intracranial tension for a long time, but may lead to progressive neurological disability. The clinical features of these lesions have been referred to earlier. Patients with tuberculomas that are infiltrative in type are not benefited by operation as surgical excision leads to a permanent neurological deficit. On the contrary, medical treatment leads to subsidence of the lesion with return of power in the limbs.

Thus we are able to recognize two groups of tuberculomas from angiographic, clinical and operative observations: (1) The avascular type which often is deep and acts like a space-occupying lesion. Surgery is often necessary. (2) The other group, smaller in number, which shows mild vascularity in angiography and is more superficial in location and requires operation only in selected cases.

Cerebral angiograms are also useful in determining the line of treatment to be adopted. If the angiogram shows only a local disturbance, without general increase of tension, immediate surgery is not indicated. Changes in vascular pattern may occur without increased intracranial pres-

sure (Figs. 6 and 7); in this case the middle cerebral artery was elevated without shift of the anterior cerebral artery to the opposite side. The patient did well on antituberculous treatment.

Angiography may show the presence of multiple tuberculomas which may alter the line of approach to the problem. Multiple tuberculomas may be diagnosed by the presence of multiple areas of vascularity or a bizarre and irregular shifting of the cerebral blood vessels.

Case 1. NS 9511/57. P., a woman, aged 45, was admitted in a drowsy state with left hemiparesis. She had had attacks of headache for 15 years. The headaches used to come on and off, and were aggravated by any physical strain. For 6 years she had had twitches of the left fingers and the thumb. For the last 2 years the twitches had become more frequent and in the last 6 months they had spread upwards to the forearm and the arm. She had had 5 or 6 attacks of convulsions with loss of consciousness. Each attack started in the left fingers. In the last 3 months the headache had become more severe and the left upper limb had become weak. There also had been some change in personality. She was the mother of 6 children. There was no definite family history of tuberculous.

Examination. The patient was a well nourished woman. She was unconscious, responding only to painful stimuli. There was bilateral papilledema. She had left spastic hemiparesis. The cranial nerves were normal. The Mantoux test was positive.

As the patient was unconscious, immediate right cerebral angiography was done. This showed a shifting in the terminal portion of the anterior cerebral artery and a diffuse vascular lesion in the motor area. This was most evident in the anteroposterior views (Figs. 4 and 5). This was taken as evidence of multiple tuberculomatous lesions.

Operation. There was a diffuse infiltrating tuberculoma of the right motor cortex, with extension of tuberculous nodules into the subcortical area. The nodules and most of the infiltrated cerebral cortex were removed. No attempt was made to remove the smaller deep-lying tuberculoma. The patient was put on streptomycin and isonicotinic acid hydrazide.

Course. She recovered full consciousness soon after the operation and the hemiplegia recovered gradually. At present, except for residual weakness of the left fingers and thumb, there is no abnormality.

In this case, despite the presence of multiple tuberculomas, only the major lesion which was causing the pressure on the brain had to be removed.

Cerebral angiograms help in following the progress of patients who have been put on medical treatment and of those who have undergone operation.

Case 2. NS 9394/57. R.M., a girl aged 21, was
Figs. 8 and 9. Case 2. Preoperative angiograms showing elevation of left middle cerebral artery.

Figs. 10 and 11. Case 2. Postoperative angiograms showing restoration of vascular pattern to normality.
admitted with a complaint of headache, vomiting and dimness of vision. She also had difficulty in speaking. There was a history of contact with a tuberculous patient.

Examination. She was an ill-nourished young woman. She had bilateral papilledema and early nominal aphasia. The jerks in the right limbs were exaggerated and the right plantar reflex was extensor.

Roentgenograms of the lungs showed enlargement of the mediastinal glands. She was diagnosed as a case of left temporal tuberculoma. Left carotid angiography showed elevation of the middle cerebral artery in the anteroposterior and lateral views (Figs. 8 and 9).

Operation. A tuberculoma on the surface of the left temporal lobe was removed completely.

Course. For 3 weeks after operation the aphasia was worse but she recovered completely. Left carotid angiography done after 1 year showed a normal pattern of blood vessels (Figs. 10 and 11).

Angiograms are also important in that they give a clue to the existence of lesions that are nontuberculous. A patient with a history of contact with tuberculosis may have development of a glioma or a meningioma. In these cases angiography may clinch the diagnosis.

In all doubtful cases a trial with antibiotics for 2 weeks is made. If there is no clinical improvement the lesion is dealt with surgically as an intracranial tumor.

The diagnosis of the location of a tuberculoma in the brain can sometimes be made by the presence of abnormal looping of the terminal branches of the middle or the anterior cerebral arteries. The clue can be had from the arterial phase, as the capillary phase may not show any change in the vascularity.

Occasionally calcification in a tuberculoma is very dense. Angiography was done in 1 such case but it is obvious that the calcified mass does not in any way alter the vascular pattern as it is situated far forward in the frontal region (Figs. 12, 13 and 14). In another case a tuberculoma in the suprasellar region showed dense calcification without seriously altering the vascular pattern (Figs. 15 and 16).

In cases of posterior-fossa tuberculomas we find an elevation of the middle cerebral artery and a widening of the loop of the anterior cerebral artery, indicating internal hydrocephalus.

With the advent of cerebral angiography the frequency of air ventriculography has gone down in our department. If angiog-

rography is inconclusive, then air ventriculography is used to localize the lesion. In the few cases in which ventriculography was done in cases of tuberculoma it did not show any special features pertaining to a tuberculoma.

In tuberculomas of the posterior fossa Myodil ventriculography has been found useful (Figs. 15 and 16). It has been found especially useful in children, in whom posterior-fossa lesions are common. This is easier to perform and shows the lesion clearly.

CONCLUSION

By careful clinical examination and with the aid of neuroradiological investigations it has been possible to diagnose and localize tuberculomas of the brain, preoperatively in the majority of cases. The clinical and radiological assessment helps in deciding the line of treatment to be followed in these cases.

SUMMARY

1. The greater incidence of tuberculomas in certain parts of the world is pointed out.
2. A presumptive diagnosis of tuberculoma is made from a personal history of tuberculosis, or a history of contact with the infection.
3. Radiology contributed to diagnosis by discovering areas of tubercular infection elsewhere in the body.
4. The significance of the well nourished state of many patients with tuberculomas is pointed out. Clinically and radiologically, two groups have been recognized: (1) the more frequent avascular, and (2) the less common vascular type.
5. Cerebral angiography was useful in diagnosing the nature of the lesion and its location.
6. Cerebral angiography also helped to determine the line of treatment adopted.
7. Cerebral angiography has lessened the need for air studies in cases of supratentorial lesions.
8. In cases of posterior-fossa tuberculomas, Myodil ventriculography has been useful.

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REFERENCES

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