SHORT REPORT

The calcified intracorporeal vacuole: an aid to the pathological diagnosis of solitary cerebral cysticercus granulomas

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Abstract

Fifty four cases of single small (<20 mm) enhancing CT lesions (SSECTLs) of the brain that were excised between 1987 and 1995 were reviewed histologically. In 28 cases the entire cysticercus or its parts were found. In the remaining 26 cases, most had a histological picture suggestive of a parasitic granuloma. In six of these 26 cases, small ovoid masses corresponding in morphology to the intracorporeal vacuoles of a cysticercus were seen lying free in the cavitary space of the granuloma. This lends further strength to the contention that SSECTLs of the brain are caused by cysticercus, and that in the event of a surgical excision, absence of obvious parasitic parts should necessitate a closer search, as calcareous residues of the parasite might be the only evidence of the cysticercal aetiology in the granuloma.

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Twenty six per cent of Indian patients with focal or generalised seizures are found to have a single, small (<20 mm) enhancing CT lesion (SSECTL).¹ Some lesions were proved to be of cysticercal aetiology^{2,3}; however, there remained a proportion of biopsies where neither the entire cysticercus nor its parts were found, but the histological picture was suggestive of a parasitic granuloma. We focused our attention on these patients, and reviewed the histopathology of all cases of SSECTLs of the brain that were surgically excised between 1987 and 1995, to look for further clues to the presence of cysticercus in the biopsy sample.

Materials and methods

The study was done on 54 patients with SSECTLs between 1987 and 1995, who underwent surgical excision of the lesion at the Christian Medical College and Hospital, Vellore. Forty three of these patients formed part of earlier study groups.^{2,3} All had had seizures and had a single, small (<20 mm), enhancing lesion on contrast enhanced CT done just before the stereotactic craniotomy.

The granulomas were excised completely either to obtain a histological diagnosis, when the aetiology of these lesions was still unclear or as a lesionectomy, in a small proportion of patients, for intractable epilepsy.

The entire sample was fixed in 10% neutral formalin and after gross examination processed through paraffin to obtain 5 µm sections stained with haematoxylin and eosin. If light microscopy was suggestive of an inflammatory lesion but did not show the aetiology, multiple levels were examined. Ziehl Neelsen stain for acid fast bacilli and Gomori's methenamine silver and periodic acid Schiff stains for fungi were also used.

Results

CLINICAL FINDINGS

The lesions were excised from 35 male and 19 female patients whose ages ranged from 2-47 years. The duration of symptoms (seizures) at presentation ranged from 10 days to 22 years.

COMPUTED TOMOGRAPHY FINDINGS

All the 54 patients were analyzed and found to have lesions which were isodense on the plain CT with significant enhancement on the contrast scans. Twenty five lesions showed a central hypodensity with peripheral enhancement ("ring" lesion, type A lesion) and 21 had uniformly enhancing lesions ("disc lesion, type B lesion"); eight lesions were nodular (type B), which varied in size from 8 mm² to 20 mm². The lesions were surrounded by a variable amount of oedema.

GROSS AND MICROSCOPIC FINDINGS

The table shows that 45 cases were submitted whole, without sectioning, ranging in size from 0.5 to 2.0 cm in diameter. Of these, 29 were well circumscribed firm nodules and 16 were predominantly cystic lesions. In the remaining nine cases irregular fragments of tissue were submitted.

The specimens that were grossly firm and those that were cystic showed cavitary lesions in 42 out of 45 cases, with parts of an intact or degenerated cysticercus seen in 25 of these 45 cases. Seven of the nine cases that were submitted as fragments showed parts of an inflammatory cavitary lesion, with the parasite seen in three of these cases.

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Pathological findings in SSECTLs

Histological findings											
Gross				Parasite			Wall of inflammatory lesion			Adjacent cerebral parenchyma	
	Cavitary	Hyalinised nodule	Present	Absent		Present	Granulomatous inflammation of parasitic aetiology	Chronic inflammation without granulomas	Eosinophilic infiltrate	Gliosis	Perivascular chronic inflammation
				Without calcified vacuoles	With calcified vacuoles						
Cystic	16	16	3	12	4	15	1	14	11	11	
Firm	29	26	2	13	12	22	4	21	23	18	
Fragments	9	7	2	3	4	5	2	7	3	4	
Total	54	49	5	28	20	42	7	42	37	33	

The lesions contained acute or chronic inflammatory exudate in 63% of cases, and were lined by palisaded epithelioid histiocytes, surrounded by dense infiltrates of lymphocytes, plasma cells, and a few eosinophils and histiocytes. Multinucleated giant cells were present in 18 cases. A neutrophilic infiltrate was found in 37% cases. Five cases were seen as hyalinized nodules with mild chronic inflammation.

Adjacent brain tissue showed gliosis, perivascular chronic inflammation, and a variable amount of fibrosis. Caseous necrosis was not found in any case.

Of the 28 patients with cysticerci, three had the entire parasite, whereas in 18 patients only parts of the parasite were seen. In seven patients, degenerated forms of cysticercus were seen. In the remaining 26 patients where obvious parasitic parts were not seen, acid fast bacilli and fungi were also absent. A careful

search in the original and 5 µm step deeper sections showed scattered oval calcified structures, in the cavitary space in six of the 26 patients (fig 1). These calcified ovoid bodies were similar in size and shape to the thin walled intracorporeal vacuoles that are seen in the reticular layer of a cysticercus. Of the 21 patients with the cysticercus showing a well preserved morphology, these intracorporeal vacuoles were seen in 15 patients, with calcification of the vacuoles in 11 patients. Five of seven patients with the degenerate forms of cysticercus, showed amorphous eosinophilic outlines of the parasite lined by oval calcified masses, corresponding in size and shape to the intracorporeal vacuoles of the intact parasite (fig 2).

Discussion

There has been a lot of controversy on the aetiology of single, small, enhancing CT lesions (SSECTLs), in patients presenting with seizures.¹⁻⁴⁻⁶ As discussed by Rajshekhar,⁶ various presumptive diagnoses were made initially; however, biopsy evidence during the past decade showed that most of these lesions were caused by cysticercosis.³

In the present study although all patients were similar on clinico-radiological grounds, the cysticercal aetiology of the granuloma was evident only in 52% of cases. There were a substantial number of solitary granulomas, 26 of 54 patients, that did not exhibit the parasite or its parts. These 26 patients, however, did not have features suggestive of tuberculosis or a fungal granuloma. In fact, all had histological features that favoured a parasitic aetiology—namely, (1) a cavitary inflammatory lesion, where the histiocytes formed a palisaded inner lining; (2) the presence of eosinophils in the inflammatory infiltrate; (3) the absence of caseous necrosis; and (4) the absence of acid fast bacilli and fungal elements in especially stained sections.

In the patients where no parasitic parts were discerned, oval calcified bodies were detected lying free in the cavitary space, in six cases, corresponding in morphology to the intracorporeal vacuoles seen in the body of a cysticercus. From our findings it is therefore apparent that as the parasite degenerates, the parasitic structures that come into prominence are these calcified intracorporeal vacuoles, which probably due to their calcific nature, are resistant to degeneration and are the last to disappear. These ovoid bodies may on occasion

Figure 1 Calcified bodies in amorphous debris without any typical cysticercal body parts. (Haematoxylin and eosin, original magnification×200.)

Figure 2 Degenerated cysticercus outlined by calcified intracorporeal vacuoles. (Haematoxylin and eosin, original magnification×200.)

be the sole parasitic remnant seen in a biopsy. We therefore think that the presence of the calcified intracorporeal vacuole alone, without other morphological features of the parasite is an aid to the pathological diagnosis of cysticercosis.

Conclusion

In conclusion, solitary cerebral cysticercus granulomas are usually stereotypical in their clinical and CT presentation. However on histological evaluation they seem to span the entire range of pathological processes that result from the natural evolution of the parasite. At one end of the range the whole parasite might be identified and at the other end calcareous residues might be the only evidence of the cysticercal aetiology of the granuloma. It needs to be reiterated however that surgical excision of an SSECTL is neither rec-

ommended nor required in most cases and that pathological verification is indicated only for enlarging or persistent lesions.³

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