

Geographically Specific Epilepsy Syndromes in India

Solitary Cerebral Cysticercus Granuloma

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Summary: Solitary cerebral cysticercus granuloma (SCCG) is one of the commonest causes of seizures in Indian patients. SCCG has been confused in the past with tuberculomas, but by applying a set of diagnostic criteria proposed by the author, they can be diagnosed accurately in the vast majority of patients. Patients with SCCG are managed effectively with anti-

epileptic drugs (AEDs). The role of cysticidal drugs in their management is controversial. SCCG resolves spontaneously at a variable rate and has a good seizure outcome, with >90% of patients remaining seizure free after discontinuation of AEDs. **Key Words:** Cysticercosis—Epilepsy—Computed tomography.

Solitary cerebral cysticercus granuloma (SCCG), the commonest cause of partial seizures in Indian patients, is seen among 26 and 50% of Indian patients with partial seizures (1,2). SCCG was initially noted on computed tomographic (CT) studies performed in Indian patients with seizures, in the late 1970s and early 1980s, as a solitary small enhancing lesion. For various reasons, it was identified as an “immature tuberculoma” or “micro-tuberculoma,” and patients with the lesion were treated with antituberculous therapy (ATT) (3,4). Sethi et al. (5) in 1985 made the fortuitous discovery that these lesions resolved spontaneously and labeled them “appearing and disappearing abnormalities.” The etiology of the single, small, enhancing CT lesion (SSECTL) was revealed only in the late 1980s from pathological studies performed on excised lesions in a series of patients with SSECTL in our center (6–8). We had the opportunity to study prospectively >450 patients with SSECTL from 1991 to 1996, and this resulted in the elucidation of various aspects of this lesion including its natural history.

PATHOLOGY

Cysticercosis is caused by the larval form of *Taenia solium*. Once a cysticercal cyst lodges in the parenchyma of the brain, it undergoes spontaneous involution over varying periods. According to Escobar (9), a parenchymal cysticercus cyst typically goes through four stages of involution: (a) vesicular, (b) colloidal, (c) granular–

nodular, and (d) calcific. This entire process may take between few weeks and several years. The first two stages are considered to represent the live parasite, and the last two, the dying or dead forms of the parasite. An SCCG is the granular–nodular form of the parenchymal cyst. A live cyst is generally asymptomatic, evoking minimal or no host immune response. With the disintegration of the cyst wall, the parasitic antigen is exposed to the host immune system, and this results in an inflammatory response around the cyst. The subsequent formation of granulation tissue and edema around the parasite triggers the symptoms of seizures or headache in the host.

INCIDENCE

Although most series of patients with SCCG are reported from India, these lesions are universally prevalent, and isolated cases or small series have been reported from all parts of the world (10–14). The granuloma has been reported in patients from all parts of India and in all age groups. SCCGs account for nearly 60–70% of all forms of neurocysticercosis (NCC) seen among Indian patients (15).

CLINICAL PRESENTATION

Between 70 and 88% of patients with SCCG have partial seizures with or without secondary generalization. Generalized seizures and other forms of seizures also may occur in these patients. Patients usually have a flurry of seizures or a single seizure at presentation. The seizures may recur at varying intervals after the initial ictus. Only a small minority (<1%) of patients have status epi-

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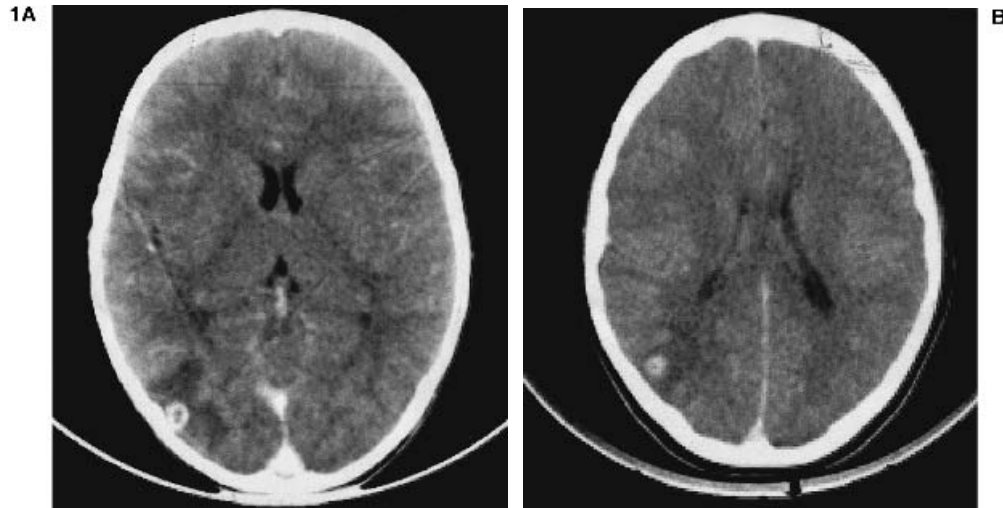


FIG. 1. Contrast-enhanced CT scans showing a “ring” (A) and a “disk” (B) lesion with edema.

lepticus. An important feature of the clinical presentation is the lack of progressive neurologic deficit or features of increased intracranial pressure in these patients. About 7% of patients have severe episodic headache, which alone might mimic subarachnoid hemorrhage (16).

IMAGING FEATURES

SCCG is seen on a contrast CT scan as an enhancing rounded lesion, which measures <20 mm in maximum dimension. It is often located at the superficial cortical regions of the frontal or parietal lobes. The lesion may have uniform enhancement (“disk”), peripheral enhancement with central hypodensity (“ring”), or may have peripheral enhancement with a small hyperdense dot within the central lucency (“ring with dot”). All these constitute type A lesions on the CT scan (Fig. 1). The “dot” in the “ring” represents the scolex, and this appearance was seen in only 10% of our patients. In 9.2% of patients, we noted a lesion composed of two attached disks or rings (type B) but that still measured <20 mm in maximum dimension. Edema may or may not be associated with the lesion but is rarely severe enough to cause a shift of the midline structures. On magnetic resonance imaging (MRI), an SCCG is seen best in the gadolinium-enhanced sequences as a ring-enhancing lesion (Fig. 2). On T₂-weighted images, the granulomas appear to have a central hyperintensity with a peripheral ring of hypointensity. The granuloma might be isointense on nonenhanced T₁-weighted images. We compared the relative yield of a thin-slice contrast-enhanced CT and MRI in the visualization of SCCG and concluded that if the CT examination is properly performed with adequate contrast injection, both modalities have almost equal sensitivity (17). MRI should be performed with contrast injection in all patients suspected to be harboring an SCCG, as plain images might not reveal the granuloma in some patients.

DIFFERENTIAL DIAGNOSIS AND DIAGNOSTIC CRITERIA

The main differential diagnoses for an SCCG on CT or MRI are tuberculoma, metastatic deposit, pyogenic abscess, and a small glioma. Based on the clinical and CT features of histologically verified SCCG and solitary tuberculomas in patients with seizures, we published a set of diagnostic criteria for SCCG, which included clinical and CT features (18) (Table 1). These criteria were validated in a prospective study and found to have a sensitivity of 99.5% and specificity of 98.9% (18).

COURSE OF THE ILLNESS

Most patients (85–90%) respond to a single AED. In our series, 14.5% of patients had breakthrough seizures



FIG. 2. Gadolinium-enhanced T1-weighted MR showing a typical ring-enhancing solitary cerebral cysticercus granuloma with surrounding edema.

TABLE 1. Diagnostic criteria for solitary cysticercus granuloma in patients with seizures

Clinical criteria
Patient should have seizures;
There should be no features of persistent increased intracranial pressure;
There should be no evidence of a progressive neurologic deficit; and
There should be no evidence of a systemic illness such as primary malignancy, pulmonary or systemic tuberculosis, and/or focus of pyogenic infection
Computerized tomographic criteria
The lesion should be solitary;
The lesion should enhance after contrast injection;
The lesion should measure <20 mm in maximum dimension; and
Edema may or may not be present around the lesion, but if present, should not be severe enough to cause a shift of the midline structures.

All criteria must be satisfied to make a diagnosis of solitary cysticercus granuloma.
Modified from ref. 18.

after starting AED therapy and required an increased dose of AED or the addition of second AED. The recurrence of seizures might occur after a long period of quiescence and might occur on one or several occasions. We believe that periodic release of the parasitic antigen within the cyst results in episodic symptoms. Patients with SCCG do not develop features of increased intracranial pressure or progressive neurologic deficit at any point in their illness.

MANAGEMENT

AEDs are the mainstay in the management of patients diagnosed to have an SCCG. Monotherapy with a single AED is adequate in >85% of patients. Patients should be counseled to come for periodic reviews at intervals of ≤ 3 months. At each review, patients should be assessed carefully for new symptoms and signs (especially increased intracranial pressure and focal neurologic deficits). Presence of either of these mandates a repeated imaging. A routine follow-up imaging (CT or MR) with contrast injection and thin slices in the region of interest should be requested 6 months after the initial CT examination, even in asymptomatic patients. The purpose of the follow-up imaging is to document resolution of the granuloma (partial or complete), as spontaneous resolution almost confirms the diagnosis of an SCCG. An enlargement of the lesion to >20 mm warrants surgical excision to determine the pathology of the lesion. About 7% of SCCGs seem to enlarge significantly on follow-up scans ("enlarging SCCG") (19).

The duration of AED therapy in patients with SCCG is still unresolved. We recommend early discontinuation of AEDs soon after a documented resolution of the granuloma, provided that the patient has not had a seizure in the preceding 3 months. However, others suggest that the duration of AED therapy should be similar to that with other epilepsy (that is, for 2–3 years after the last seizure).

There have been contradictory reports on the efficacy of cysticidal drugs such as albendazole in patients with

SCCG (20–22). It is not clear whether albendazole therapy hastens the resolution of the granuloma or affects the seizure outcome in these patients. We prescribe albendazole (15 mg/kg body weight in two divided doses for 14 days) for patients with lesions that are persistent for >6–12 months after initial diagnosis. Clinicians should be cautious about the side effects of the drug in these patients as up to a third of patients with SCCG have been reported to have adverse reactions with albendazole (23). Concurrent steroid therapy, surprisingly, did not seem to prevent the adverse reactions, although we recommend its use in all patients who are prescribed albendazole.

Surgical therapy is rarely required for these patients. Present indications include an enlarging lesion or a persistent lesion with "difficult to control" seizures. Image-guided surgery in some form is required to guide the excision of these small lesions located in the eloquent regions of the brain.

OUTCOME

Spontaneous resolution of an SCCG is the rule, but the rate of resolution is highly variable in individual patients. We recently studied the rate of spontaneous resolution of freshly diagnosed SCCG (imaging done within a month of onset of seizures) in 210 patients and found that only 18% of granulomas had resolved completely by 3 months, and 67%, by 1 year (24).

The seizure outcome is good, with >90% of patients remaining seizure free even after discontinuation of AEDs. Murthy and Reddy (25) reported recurrence of seizures in only one of 102 patients with SCCG in whom AEDs were discontinued soon after the radiologic resolution of the granuloma was documented.

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