Single small enhancing CT lesion in Thai patients with acute symptomatic seizures: a clinico-radiological study

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Summary

OBJECTIVE To identify the frequency of single small enhancing CT lesion cases (SSECTL) in a provincial hospital in Thailand and verify a set of clinico-radiological criteria for the diagnosis of benign SSECTL.

METHODS All patients who fulfilled the following criteria were recruited: acute symptomatic focal seizures with or without secondary generalization; minimal or no neurological deficit; no evidence of raised intracranial pressure; no evidence of systemic disease; CT scan showing SSECTL of <20 mm diameter. After recruitment, patients received antiepileptic drugs and other symptomatic treatment. A CT scan of the brain was repeated every 2 weeks until the lesion had significantly resolved, which was defined as a 50% decrease in size. A CT scan was then taken every 4 weeks until the lesion had completely disappeared or turned into a calcified spot. The data from all other patients presenting with seizures and solitary enhancing lesion on the CT scan who did not fulfill the inclusion criteria were also reviewed.

RESULTS 972 patients with seizure disorder were recruited. 110 patients (11.3%) presented with seizure and solitary enhancing lesion on the CT scan, 22 of whom (20%) fulfilled the inclusion criteria. 20 of the 22 patients had SSECTL with a spontaneous resolution: 14 (70%) within 4 weeks and 18 (90%) within 8 weeks. Two patients had a progressive course. One patient with a solitary enhancing CT lesion of 20 mm had spontaneous resolution. 87 patients had another diagnosis. The diagnostic criteria for benign SSECTL were 95.23% sensitive, 97.75% specific, had a positive predictive value of 90.91% and a negative predictive value of 98.86%.

CONCLUSION SSECTL is not uncommon in our provincial hospital. The clinico-radiological criteria proposed by Rajshekhar (1991) are valid and reliable in predicting a benign outcome. CT follow-up within the first 4 weeks is critical.

keywords symptomatic seizures, single CT lesion, SSECTL

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Introduction

A single small enhancing CT lesion (SSECTL) is a common finding in patients presenting with acute symptomatic seizures in tropical countries. In the series reported by Wadia et al. (1987), 26% of Indian patients with focal epilepsy had SSECTL. Various differential diagnoses have been considered for this CT type (Rajshekhar 1991; Carpio et al. 1998). From previous studies in various countries, the aetiologies were categorized into 2 main groups: The first group was considered as ‘dying cysticercus’, suggested to be the most common cause of SSECTL (Chandy et al. 1989, 1991). This group had a benign clinical course and usually a spontaneous resolution after a brief period of follow-up ranging from a few weeks to 3 months (Sethi et al. 1985; Ahuja et al. 1989; Murthy & Subba Reddy 1998). The second group was uncommon, needed more aggressive diagnostic approaches and included tuberculoma, pyogenic abscess, toxoplasmosis, cavernous angioma and primary or metastatic tumours of the brain. In clinical practice, there remains a great deal of controversy regarding the optimal diagnostic and therapeutic approach to this problem. Rajshekhar (1991) has proposed clinico-radiological criteria for the diagnosis of the benign spontaneous resolved lesion, which however, have not been verified outside the Indian subcontinent (Rajshekhar & Chandy 1997; Carpio et al. 1998).
Since Thailand is endemic for cysticercosis, tuberculoma and other central nervous infectious diseases, SSECTL is supposed to be common in medical practice. We conducted this study to determine the frequency of this condition in a provincial hospital and to verify the previously proposed clinico-radiological criteria for the diagnosis and management of SSECTL in our setting.

**Materials and methods**

The study was conducted from June 1994 to June 1997 in Surin General Hospital, a referral medical centre for the southern part of Thailand’s north-eastern region which covers about 2 million people. The hospital has 652 beds and receives patients from primary care and provincial hospitals as well as private clinics and hospitals. All patients with seizures and solitary enhancing CT lesion (SECTL) were included. The criteria for diagnosis of benign SSECTL (Appendix 1) were acute symptomatic focal seizures with or without secondary generalization; minimal or no neurological deficit; no evidence of raised intracranial pressure; no evidence of systemic disease; and a CT scan showing an SSECTL (diameter < 20 mm) (Rajshekhar 1991). Patients with SSECTL underwent investigations including complete blood count, plasma glucose, blood urea nitrogen, creatinine, electrolytes, ESR and VDRL. The chest was X-rayed for pulmonary tuberculosis, primary or metastatic lesion of the lung, and soft tissue X-ray was done to detect calcified cysticercosis. Immunodiagnosis of human cysticercosis, particularly an enzyme-linked immunosorbent assay (ELISA) and enzyme-linked immunoelectrotransfer blot assay (EITB) were not available in our hospital, as is the case in most health centres in Thailand.

The patients received phenytoin and other symptomatic treatments. No antiparasitic, antimicrobial or steroid drugs were prescribed. All patients with SSECTL had a regular follow-up every 2–4 weeks for 6–18 months. CT scans were repeated every two weeks until the lesion had a significant resolution which was defined as ≥ 50% reduction in size. (Figures 1 and 2). The clinical part of the study was followed-up by a neurologist (PY) and the image interpreted by a radiologist (AM). Then a CT scan was performed every 4 weeks until the lesion had completely disappeared or resolved to a calcified spot. Repeated imaging over this time to investigate a ring or disc enhanced lesion is standard practice for evaluation of suspected focal central nervous system lesions in Thailand. Any deterioration either in clinical manifestations or imaging during the follow-up period prompted an alternative diagnostic approach. Those patients with SECTL who did not fulfil the criteria for diagnosis of benign SSECTL were managed according to suspected diagnosis, e.g. removal of brain tumour, and followed-up for 6 months.

The data from all patients presenting with seizures and solitary enhancing lesion on the CT scan in the period of the study were reviewed and the sensitivity, specificity, positive and negative predictive value for Rajshekhar’s criteria were analysed.

**Results**

During the study period, 972 patients with various seizure disorders were seen. 110 patients presented with seizure and...
solitary enhancing lesion on the CT scan (11.3%). Of these 110 patients, 14 men and 8 women (20%) fulfilled the criteria for diagnosis of benign SSECTL (20%). The average age was 31.6 years (range 10–60). All routine blood investigations were unremarkable. Chest and soft tissue X-rays revealed no evidence of pulmonary tuberculosis or calcified cysticercosis in the soft tissue. 88 patients were excluded, for reasons given in Table 1. Twenty of the 22 patients had SSECTL with a spontaneous resolution (true positive cases). In this group, the average age was 31.5 years (range 10–60), with a 3:2 male-female ratio.

Seizures were the presenting symptom in all of these patients, on average 2.1 before admission (range 1–10). The duration of seizure was < 2 min in all cases except one case who had epilepsy partialis continua for 4 h. The average time period between onset of symptoms and admission was 4 days (range 1 day to 6 weeks). All patients had postical paralysis and recovered fully, most within 48 h. Seizures were well controlled by phenytoin. Prodromal symptoms occurring before seizures were low-grade fever and malaise in 4 of 20 patients (20%). Nonspecific preictal symptoms included headache (8; 40%), focal weakness (3; 15%) and numbness (5; 25%). Headaches were mild to moderate (75% mild, 25% moderate) in severity, diffuse in 3 of 8 (37.5%) and unilateral at the site of the lesion in 5 of 8 cases (62.5%). Both focal weakness and numbness corresponded with the lesion on the CT scan. Focal weakness was transient in 2 of 3 cases; focal numbness in 3 of 5. The duration of transient focal deficit ranged from a few minutes to hours.

The imaging study revealed a lesion in the frontal lobe of 11 and in the parietal lobe of 9 patients. The relation between seizure type and location of CT lesion is shown in Table 2; the duration of lesional resolution on CT scan in Table 3. All but one of the cases who significantly resolved had complete resolution except one who had a residual calcified spot. 14 of 20 (70%) patients had significant spontaneous resolution within 4 weeks and 18 of 20 (90%) within 8 weeks.

Two of 22 patients had progressive course (false positive cases). One was an 18-year-old male who required excisional biopsy because of uncontrolled frequent seizures; the pathological result was eosinophilic granuloma. The other was a 10-year-old girl who had failed to improve after 3 months of follow-up. Biopsy was advised but the patient refused. Anti-tuberculous drugs were prescribed, and the solitary enhancing lesion disappeared after 4 months of therapy. Tuberculoma was the probable diagnosis.

One patient had enhancing CT lesion > 20 mm without clinical features of raised intracranial pressure. Close clinical and serial CT follow-up revealed spontaneous resolution.

Table 1 The reasons for exclusion of 88 patients from Rajshekhar’s criteria

<table>
<thead>
<tr>
<th>Sign or symptom</th>
<th>No.</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signs and symptoms of increased intracranial pressure</td>
<td>55</td>
<td>62.50</td>
</tr>
<tr>
<td>Fixed neurological deficit after seizure</td>
<td>53</td>
<td>60.23</td>
</tr>
<tr>
<td>CT scan show diameter of lesion &gt; 20 mm</td>
<td>74</td>
<td>84.09</td>
</tr>
<tr>
<td>Evidence of shift of midline structure from brain oedema</td>
<td>61</td>
<td>69.32</td>
</tr>
</tbody>
</table>

Table 2 Types of seizure and location of CT lesions in 20 SSECTL patients who had spontaneous resolution

<table>
<thead>
<tr>
<th>Seizure types and progression</th>
<th>Location</th>
<th>Frontal</th>
<th>Parietal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP (M)</td>
<td></td>
<td>8</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>SP (S) → SP (M)</td>
<td></td>
<td>–</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>SP (M) → GTC</td>
<td></td>
<td>3</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>SP (S) → SP(M) → GTC</td>
<td></td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GTC</td>
<td></td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CP</td>
<td></td>
<td>–</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>EPC</td>
<td></td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>11</td>
<td>9</td>
<td>20</td>
</tr>
</tbody>
</table>

*SP(M), Simple partial motor; SP(S), Simple partial sensory; GTC, Generalized tonic clonic; CP, Complex partial; EPC, Epilepsia partialis continua.

Table 3 Duration of significant resolution* of lesion on CT scan follow-up

<table>
<thead>
<tr>
<th>Duration of follow-up (weeks)</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10–18</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases</td>
<td>3</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
</tbody>
</table>

*significant resolution is 50% or greater reduction from initial size.
without any treatment (false negative case). 87 patients had other diagnoses such as glioma, tuberculoma, brain abscess, primary or metastatic brain tumour (true negative cases). Using standard formulae (Weiss 1998) (Table 4), the criteria for benign SSECTL were 95.23% sensitive, 97.75% specific, had a positive predictive value of 90.91% and a negative predictive value of 98.86%. The point prevalence was 19.09%.

Discussion

SSECTL is a worldwide problem, especially in tropical countries endemic for cysticercosis (Rajshekhar 1991). In our hospital we encountered more than 20 cases in 3 years, representing 20% of SECTL in our hospital. There is presently no sensitive noninvasive test to separate patients with cysticercus granuloma from those with noncysticercal solitary CT lesions (Garcia et al. 1991; Rajshekhar et al. 1991; Carpio et al. 1998). Diagnostic tests or criteria are essential for the management of SSECTL. We have evaluated the clinicoradiological criteria proposed by Rajshekhar (1991) and found them to be highly sensitive and specific. All but two of the 22 patients who fulfilled them had spontaneous resolution. Close clinical and CT follow-up remain essential.

We had only one probable case of tuberculoma and no tumour. This supports earlier findings that single tuberculoma and tumour rarely present with clinicoradiological characters of SSECTL. Rajshekhar et al. (1993) also found no case of single tuberculoma < 20 mm in size and hypothesized that solitary cerebral tuberculoma has to reach a certain critical size before producing symptoms.

The clinical symptoms in patients with spontaneously resolved CT lesion were usually benign. Most seizures were easily controlled with antiepileptic drugs and left no neurological deficit, even in the patient with epilepsy partialis continua.

Nonspecific prodromal and preictal symptoms seldom mentioned and presented in this study were low grade fever, malaise, headache, transient focal weakness and numbness in the corresponding lesional area occurring hours up to days before onset of seizures. Fever, malaise and diffuse headache may indicate inflammatory reaction of the developing lesion which is postulated to be a dying cysticercus. Unilateral headache on the same side as the lesion may be related to traction-inflammatory headache from the cortical lesion. Transient focal deficit mimicking TIA may be nonictal focal seizure or ictal paralysis (So 1995) occurring before an overt seizure. Seizure types are mainly simple partial motor and simple partial sensory with or without generalization (Garg & Nag 1998). None of our patients had complex partial seizure, reported as a rare occurrence in the literature (Sethi & Nagar 1998). We prescribed no anticysticercal drugs but found spontaneous disappearance within 4 weeks in a significant number of our patients. Therefore the efficacy of anticysticercal drugs for the treatment of SSECTL needs further careful consideration.

In conclusion, SSECTL is not uncommon in our provincial

Table 4 Evaluation of diagnostic criteria for benign SSECTL

<table>
<thead>
<tr>
<th>Diagnostic criteria</th>
<th>Benign SSECTL</th>
<th>Other lesions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive for benign SSECTL</td>
<td>20</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Negative for benign SSECTL</td>
<td>1</td>
<td>87</td>
<td>88</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>89</td>
<td>110</td>
</tr>
</tbody>
</table>

SSECTL, single small enhancing CT lesion; Sensitivity, 95.23%; Specificity, 97.75%; Positive predictive value, 90.91%; Negative predictive value, 98.86%; point prevalence, 19.09%.
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hospital. The proposed clinico-radiological criteria are highly sensitive and specific in predicting benign outcome. However, close clinical and CT follow-up remain essential to confirm the diagnosis and detect other malignant aetiologies. In order to verify a predicted benign course, CT follow-up within the first 4 weeks is critical.

Acknowledgements
The authors gratefully acknowledge the suggestions from Professor Kammant Phanthumchinda.

References


Wadia RS, Makhale CN, Kelkar AN & Grant KB (1987) Focal epilepsy in India with special reference to lesions showing ring or disc like enhancement on contrast computed tomography. Journal of Neurology, Neurosurgery, Psychiatry 50, 1298–1301.

Appendix 1
Diagnostic criteria for benign SSECTL. All criteria must be satisfied for a diagnosis of benign SSECTL (Rajshekhar 1991)

Clinical
Seizures (partial or generalized) should be the initial symptom
There should be no features of persistent raised intracranial pressure
There should be no history of a progressive neurological deficit
There should be no evidence of an active systemic disease

Computer tomography
CT scan should only show a solitary, contrast-enhancing lesion
The lesion should measure less than 20 mm in maximal diameter
Oedema may or may not be present but is not severe enough to produce a shift of the midline structures