

## Original Research Article

# A study of clinical profile and etiology ring enhancing lesion in CT scan brain at a tertiary care center

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## ABSTRACT

**Background:** Confusion lies over the diagnosis when the patients show ring enhancing lesions of the brain on CT scan. Some consider it as tuberculoma while some consider it as cysticercosis. More studies are required to give clear picture of ring enhancing lesions of the brain. The objective was to study clinical profile and etiology ring enhancing lesion in CT scan brain at a tertiary care center.

**Methods:** This study was conducted in the Department of General Medicine, SVS Medical College, Mahabubnagar district which is a tertiary care referral hospital in the state of Telangana. This study was done during the period from July 2006 to October 2008. A total of 50 cases were taken up for this study. After selecting the patients for the study, already prepared protocol was followed strictly for each patient. The protocol contained identification data, detailed history and examination of central nervous system and peripheral signs for tuberculosis and cysticercosis.

**Results:** The males were more than the females and 14-24 years age group was most affected. The most common presentation of ring enhancing lesions was seizures alone in 72% of the cases. Out of these cases the most common presentation was generalized tonic-clonic seizure in 40% of the cases. Majority i.e. 45 had single ring enhancing lesion on CT scan of the brain. The most common etiology of the ring enhancing lesion was found out to be neurocysticercosis in 54% of the cases of ring enhancing lesions.

**Conclusions:** Ring enhancing lesions should be considered in differential diagnosis of those who present with seizures in endemic areas like India.

**Keywords:** Brain, clinical profile, CT scan, etiology, ring enhancing lesion

## INTRODUCTION

The introduction of computerized tomography (CT) in India in early 1980s demonstrated that several patients presenting with seizures had single ring enhancing lesions. The exact pathological nature of ring enhancing lesions has not been verified as biopsy of such lesions only had been carried out in isolated cases. Various presumptive diagnoses such as tuberculoma, cysticercosis, transient viral encephalitis, micro abscess,

posterior enhancement and vascular lesions have been considered.<sup>1</sup>

Some consider it as to be tuberculoma. They treated patients with anti-tuberculosis drugs and the lesions disappeared after treatment with anti-tuberculous drugs. Some of the patients developed toxicity to anti tuberculosis drugs and these drugs were withdrawn and it has been noticed that even without anti tuberculous drugs some of these lesions resolved.<sup>2</sup>

One author presented evidence that most of these lesions have disappeared when treated with anti-convulsant drugs alone.<sup>3</sup>

One more author reported that these lesions showed a spontaneous resolution and they were popularly termed as disappearing lesions. This led to further confusion and controversy on the etiology of these lesions.<sup>4</sup>

Although single ring enhancing lesions are the commonest radiological abnormality in patients with seizures, several non-epileptic manifestations were described in the literature with these lesions.<sup>5,6</sup> They were hemi paresis, monoparesis, hemi chorea, episodic headache, aphasia and raised intra cranial tension. Like epileptic disorder these also have a benign course.

The two most commonly considered diagnosis for these lesions are neurocysticercosis and tuberculoma. The differentiation between cerebral tuberculoma and cysticercosis granuloma assumes greater importance because of the fact that both disease processes usually prevalent in the same population.<sup>7</sup>

As both lesions can be managed conservatively, it would be ideal if an etiological diagnosis be made without biopsy. The importance of differentiating these two etiologies cannot be adequately emphasized. Whereas solitary cysticercosis granuloma is a benign disorder that resolves spontaneously, a tuberculoma requires prolonged therapy with potentially toxic drugs.<sup>7</sup>

This present study was carried out at SVS Hospital, in Mahabubnagar which a tertiary care centre is catering to a large patient input mainly from rural areas as well as semi urban. Thus, reflecting the true incidence of ring enhancing lesions in the local community presumed mainly due to Neurocysticercosis (NCC) and tuberculoma. We could find cases presenting with seizures of varied pattern and with ring enhancing lesion on CT presenting as different non epileptic manifestations.

## METHODS

This study was conducted in the Department of General Medicine, SVS Medical College, Mahabubnagar district which is a tertiary care referral hospital in the state of Telangana. This study was done during the period from July 2006 to October 2008.

A total of 50 cases were taken up for this study

### Inclusion criteria

- Patients admitted in the hospital with seizures and other neurological manifestations and CT scan of the brain showing ring enhancing lesion/lesions,
- Age more than 14 years.

### Exclusion criteria

- Patients with obvious cause for seizures and other neurological manifestations like head injuries, family history of epilepsy and other long-term neurological illnesses were excluded from the study
- Patients not willing to participate in this study.

After selecting the patients for the study, already prepared protocol was followed strictly for each patient. The protocol contained identification data, detailed history and examination of central nervous system and peripheral signs for tuberculosis and cysticercosis.

Detailed history was taken including age, sex, religion, literacy status, family size, income. Clinical presentation pertaining to patients presenting with seizures whether it was partial or complete, simple or complex, number of episodes of seizures with duration was noted. Other presenting symptoms like headache, fever, nausea and vomiting, loss of consciousness, visual disturbances, speech disturbances, weakness and any other were also recorded.

Past history of head injury, convulsions, tuberculosis, ear discharge, consuming pork, passing tape worms in the stools was noted down. Family history of convulsions, tuberculosis and neurocysticercosis was recorded. Personal history pertaining to diet, appetite, sleep, bowel and bladder habits and any addictions was noted down.

General physical examination was carried out like height, weight, body mass index, waist hip ratio, pallor, cyanosis, jaundice, clubbing, edema and subcutaneous nodules. Vital data like pulse, blood pressure, respiratory rate and temperature was recorded for all the patients included in their present study.

In the examination of the central nervous system, handedness, higher intellectual functions, cranial nerves, motor system were examined in detail as per the standard protocol. Attitude of the patient in bed was noted. Muscular system was examined in terms of bulk, tone, power on both the sides of both the upper and lower limbs. Coordination and involuntary movements were also recorded. Superficial and deep reflexes were also tested in all points. Sensory system was examined in terms of touch, position sense, vibration, pain, temperature, cortical sensations. Meningeal signs and cerebellar sign, gait, skull and spine and neurocutaneous markers were also examined and noted down for all the patients.

Investigations like complete blood picture, erythrocyte sedimentation rate, chest X ray, Mantoux test, cerebrospinal fluid analysis and CT scan of the brain was done for all the patients.

The data was analyzed using proportions.

## RESULTS

Table 1 shows distribution of patients as per sex. The males were more than the females. There were 32 males and 18 females. The male to female ratio was found out to be 1.7:1. That means for every female affected almost two males were found to be affected as per the results of the present study. Thus, it can be stated based on these findings that ring enhancing lesion affects males more as compared to the females. Hence, we found that 64% of the males were affected as compared to only 36% of the females affected due to ring enhancing lesion.

**Table 1: Distribution of patients as per sex.**

Sex	Number	Percentage
Male	32	64
Female	18	36
Total	50	100

Table 2 shows age distribution of the study subjects. The most commonly affected age group was younger age group of 14-24 years in which more than half of the cases of ring enhancing lesion were seen. This was followed by the age group of 25-34 years in which about one third of the cases of ring enhancing lesion were seen. There were nine cases of ring enhancing lesion in the age group of more than 34 years of age. Thus, the ring enhancing lesions was found to be affecting the younger age group more as compared to the older age group. As the age increased, the incidence of the ring enhancing lesions was found to be decreased.

**Table 2: Age distribution of the study subjects.**

Age (years)	Number	Percentage
14-24	26	52
25-34	15	30
> 34	09	18
Total	50	100

Table 3 shows clinical presentation of the ring enhancing lesions. The most common presentation of ring enhancing lesions was found out to be seizures alone in 72% of the cases. One case of ring enhancing lesions presented with seizures with focal deficit that amounted to 2%. Two cases of ring enhancing lesions presented with seizures with episodic headache. Four cases of ring enhancing lesions presented with focal neurological deficit and four cases of ring enhancing lesions presented with only headache. Visual disturbances were present in two cases of ring enhancing lesions.

Table 4 shows distribution of cases as per type of seizures. Out of 50 study participant of the present study, 40 patients were presented with seizures with or without associated features. Out of these 40 cases presenting with seizures, the most common presentation was generalized tonic-clonic seizure in 40% of the cases. Next most common presentation was partial seizures in 32.5% of the

cases. 11 cases (27.5%) presented with Secondary generalized tonic-clonic seizure. Thus, seizures are very common in patients with ring enhancing lesions and among all such patients having ring enhancing lesions and presenting with seizures generalized tonic clonic seizures were very common.

**Table 3: Clinical presentation of the ring enhancing lesions.**

Clinical presentation	Number	Percentage
Seizures alone	36	72
Seizures with focal deficit	01	02
Seizures with episodic headache	02	04
Focal neurological deficit	04	08
Headache alone	04	08
Visual disturbances	02	04
Total	50	100

**Table 4: Distribution of cases as per type of seizures (N = 40).**

Type of seizure	Number	Percentage
Partial	13	32.5
Secondary generalized tonic-clonic seizure	11	27.5
Generalized tonic-clonic seizure	16	40
Total	40	100

Table 5 shows distribution of study subjects as per type of focal deficit. Out of 50 study participant of the present study, five patients were found to have focal deficit. Out of these five patients who were found to have focal deficit, two i.e. 40% had right hemi paresis. Out of these five patients who were found to have focal deficit, two i.e. 40% had left hemi paresis. Out of these five patients who were found to have focal deficit, one i.e. 20% had right crural monoparesis.

**Table 5: Distribution of study subjects as per type of focal deficit. (N = 5)**

Type of focal deficit	Number	Percentage
Right hemi paresis	02	40
Left hemi paresis	02	40
Right crural monoparesis	01	20
Total	05	100

Table 6 shows distribution of study subjects as per number of rings enhancing lesions in CT scan. Out of 50 patients having ring enhancing lesions, majority i.e. 45 were found to have single ring enhancing lesion on CT scan of the brain. Two patients with ring enhancing lesions were found to have two lesions on CT scan of the

brain. Three patients with ring enhancing lesions were found to have more than two lesions on CT scan of the brain. Thus, it can state from these observations that single ring enhancing lesion is the most common in patients with ring enhancing lesions. Presence of more than one ring enhancing lesion is very less common.

**Table 6: Distribution of study subjects as per number of ring enhancing lesions in CT scan.**

Number of lesions	Number	Percentage
Single	45	90
Two lesions	02	04
More than two lesions	03	06
Total	50	100

Table 7 shows distribution of study subjects as per etiology of ring enhancing lesions. The most common etiology of the ring enhancing lesion was found out to be neurocysticercosis in 54% of the cases of ring enhancing lesions. The next most common etiology of the ring enhancing lesion was found out to be tuberculoma in 18% of the cases of ring enhancing lesions. One patient with ring enhancing lesions was found to have malignancy as a cause of ring enhancing lesions. Three patients with ring enhancing lesions were found to have abscess as a cause of ring enhancing lesions. 10 patients with ring enhancing lesions were found to have causes other than neurocysticercosis, tuberculoma, abscess and malignancy of ring enhancing lesions.

**Table 7: Distribution of study subjects as per etiology of ring enhancing lesions**

Etiology	Number	Percentage
Neurocysticercosis	27	54
Tuberculoma	09	18
Abscess	03	06
Malignancy	01	02
Other	10	20
Total	50	100

Table 8 shows type of seizures and etiology. The most common etiology of the focal seizures was neurocysticercosis in 66.8% of the cases. Tuberculoma was found to be the cause in 16.6% of the cases. Other causes constituted 16.7% of the cases. The most common etiology of Secondary generalized tonic-clonic seizure was neurocysticercosis in 66.7% of the cases. Tuberculoma was found to be the cause in 11.1% of the cases. Abscess was found to be the cause in 11.1% of the cases. Other causes constituted one case.

The most common etiology of generalized tonic-clonic seizure was neurocysticercosis in 46.2% of the cases. Tuberculoma was found to be the cause in 15.4% of the cases. Abscess was found to be the cause in 15.4% of the cases. Malignancy was found to be the cause in 7.6% of the cases. Other causes constituted in two cases.

**Table 8: Type of seizures and etiology**

Type of seizure	Etiology	Number	Percentage
Focal (n = 18)	Neurocysticercosis	12	66.8
	Tuberculoma	3	16.6
	Abscess	0	0
	Malignancy	0	0
	Other	3	16.6
Secondary generalized tonic-clonic seizure (n = 9)	Neurocysticercosis	6	66.7
	Tuberculoma	1	11.1
	Abscess	1	11.1
	Malignancy	0	0
	Other	1	11.1
Generalized tonic-clonic seizure (n = 13)	Neurocysticercosis	6	46.2
	Tuberculoma	2	15.4
	Abscess	2	15.4
	Malignancy	1	7.6
	Other	2	15.4

Table 9 shows non seizure presentation and etiology. Neurocysticercosis was found to be responsible for headache in 50% of the cases while tuberculoma was responsible for headache in 25% of the cases. Abscess was found to be responsible in 25% of the cases.

Neurocysticercosis was found to be responsible in 50% of the cases of focal deficit. Tuberculoma was responsible for focal deficit in 25% of the cases. Abscess was found to be responsible for focal deficit in 25% of the cases. Neurocysticercosis was responsible in 50% of the cases

of visual disturbances. Malignancy was responsible for

visual disturbances in 50% of the cases.

**Table 9: Non seizure presentation and etiology**

Clinical features	Number of cases	Neurocysticercosis	Tuberculoma	Abscess	Malignancy
Headache	4	2 (50%)	1 (25%)	1 (25%)	0
Focal deficit	4	2 (50%)	1 (25%)	1 (25%)	0
Visual disturbances	2	1 (50%)	0	0	1 (50%)
Total	10	5 (50%)	2 (20%)	2 (20%)	1 (10%)

## DISCUSSION

We have studied 50 cases of ring enhancing lesions on CT brain, out of which males were 32 (64%) and the females were 18 (36%) revealing that men were more affected than women which correlates with the study of Chaoshuang L et al who also found that males (78.8%) are more affected than females.<sup>8</sup>

In the present study maximum number of patients were encountered in the age group of 14-35 years i.e. 82% which correlates with the study of Goni PB et al.<sup>9</sup>

In the present study most common clinical presentation of ring enhancing lesion was seizures (80%). 72% of the patients were presented with seizures alone and 8% presented with seizures and other neurological manifestations. Vazquez ML et al<sup>10</sup> noted that seizures as the only clinical presentation in 63% of the cases and overall in 84% of the cases.<sup>10</sup>

In the present study 24 patients (60%) presented with partial or secondary generalized seizures. More than one third (40%) of the cases presented with primary generalized tonic-clonic seizure, which constitutes significant proportion. So, in patients presented with generalized tonic-clonic seizure also the possibility of ring enhancing lesion should be considered. This correlates with the Sotelo J et al study who found out it to be 60.78%.<sup>4</sup>

In the present study 10 patients (20%) presented with non-epileptic manifestations like episodic headache (8%), focal neurological deficit (8%). Non epileptic manifestations are well described with ring enhancing lesions as is evident from the study of Garg RK et al.<sup>11</sup>

In the present study six patients presented with focal neurological deficits associated with other features. Of these four patients presented with hemi paresis, two patients presented with monoparesis. Hemi paresis was more common than monoparesis. In the present study two patients presented with episodic headache. Both these patients were diagnosed as neurocysticercosis. Similar presentations were reported by Garg RK et al and Cruz ME et al.<sup>11-12</sup> The explanation given was inflammatory

changes of the lesions and surrounding brain parenchyma could extend into intracranial blood vessels and meninges as a result of disruption of blood brain barrier. Crutz ML et al observed higher prevalence of neurocysticercosis among migraine patients.<sup>12</sup>

In the present study, 50 cases had ring enhancing lesion in CT scan brain. Of these, 27 patients (54%) were neurocysticercosis and nine were tuberculoma (18%), three were abscess and 10 were of other etiology (20%). Comparable incidence was found in Rajshekhar V et al study of ring enhancing lesion diagnosis by biopsy.<sup>13</sup> They reported the incidence of neurocysticercosis as 49%, tuberculoma as 11.8% and undetermined parasitic granuloma was 23.5%.<sup>13</sup>

Garg RK et al reported that incidence of neurocysticercosis was 80% among those presented with seizures with ring enhancing lesions.<sup>11</sup>

Chandy MJ et al study of small ring enhancing lesion the diagnosis was done by biopsy showed 28% were neurocysticercosis, 20% as non-specific parasitic granuloma and 52% as non-specific inflammatory changes.<sup>14</sup> This shows that the common cause of ring enhancing lesion in our population was neurocysticercosis.

Even though the tuberculoma constitutes less proportion of single ring enhancing lesion, these cases should be differentiated from neurocysticercosis as these cases require specific anti tuberculosis therapy. In the present study two third of patients presented with focal seizure and about one third of the patients presented with generalized tonic-clonic seizure. Tsang VC et al study showed equal incidence of focal and generalized seizures.<sup>15</sup>

Garcia HH et al reported partial seizures in 25% and generalized tonic-clonic seizure in 11.1% and remaining were mixed type.<sup>16</sup> Most series in India reported generalized seizures to be more common than partial seizures. In the study by Sanchez AL et al has shown that generalized tonic-clonic seizure were more common (63.8%) than focal seizures.<sup>17</sup>



## CONCLUSION

The most common presentation of ring enhancing lesion was seizures. It can also present with non-seizures manifestations like episodic headache, and focal neurological deficits in significant number of patients. So, ring enhancing lesions should be considered in differential diagnosis of those who present with these symptoms in endemic areas like India. Among the seizures about two third cases were focal seizures and about one third were generalized tonic-clonic seizure. So, in patients with generalized tonic-clonic seizure, also the possibility of ring enhancing lesion should be considered.

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