IDIOPATHIC ACUTE TRANSVERSE MYELITIS ; MR MANIFESTATION

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ABSTRACT

The purpose of this report is to describe the MR manifestations of patients who were diagnosed as idiopathic acute transverse myelitis (IATM).

Eleven patients seen in a 4–year-period at Songklanagarind Hospital with clinically proved to be IATM were retrospectively reviewed. The location, size, pattern, segmental length of abnormal hyperintensity on T2-weighted images and pattern of abnormal enhancement were determined.

The findings are summerized as followed : No abnormality was detected in one case (9%). The region of involvement was mostly in the thoracic cord (85%). Most of the lesions (84%) were longer than 1 vertebral segment. The most sensitive images were T2 weighted images and the most common pattern of abnormal signal intensity in the spinal cord was the holocord (47%). Abnormal enhancement was seen in 57% of post contrast enhanced cases and all of them showed diffused vague enhancement.

Conclusion : MR manifestations of IATM are variable and non –specific. Most of them are seen as areas of hyperintensity on SE T2 weighted images without significant cord expansion. The lesions usually extend beyond one vertebral segment. Post Gadolineum study may show vague diffused enhancements or may not be enhanced at all. All these findings are similar to other previous studies.

INTRODUCTION

Idiopathic acute transverse myelitis (IATM) is an interesting, well–recognized but poorly understood inflammatory disorder in the spinal cord. Its origin is unclear although most authors implicate an autoimmune disease.[1]

IATM is characterized by acute rapidly developing progressive lesions that affect both halves of the spinal cord in the absence of compression from any other known neurologic disease. IATM therefore is often a diagnosis of exclusion.

IATM should be distinguished from the broader category of acute transverse myelopathy that has also, sometimes confusingly, been referred to as IATM. Acute transverse myelopathy refers to any disorders that acutely affect function on both sides of the spinal cord regardless of the longitudinal extent. There are many

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other causes of acute transverse myelopathy, such as multiple sclerosis, neoplasm, infarction and trauma, which are beyond the scope of our study.

Although the major role of MR imaging is to identify treatable conditions that can mimic IATM such as acute disc herniation, hematoma, epidural abscess or compression myelopathy, there are many interesting manifestations of IATM on MR images and the cumulative cases in world literature are still few. We add our experience and describe our MRI findings.

MATERIALS AND METHODS:

The spinal MRI of 11 patients who were clinically diagnosed as idiopathic acute transverse myelitis during May 1996 – July 2000 were studied.

In all patients, clinical data including age, sex, prodomal history, date and length of symptom on set were reviewed. Prodomal history included recent illness, vaccination or trauma within 6 weeks of the onset of symptoms.

Objective clinical data from the neurological physical examination and cerebrospinal fluid profile were also recorded.

Our routine MRI technique for evaluation of suspected spinal cord lesions includes Sagittal and Axial SE T1 weighted images, T2 weighted images (1.5 T MRI unit, Magnetom-Vision : -Siemens). Additional post intravenous contrast studies (Magnevist 0.1mmol / kilogram of body weight) were obtained in eight cases in order to exclude the possibility of spinal cord tumor.

Results of all MRI examinations were reviewed by 2 radiologists and the lesions were characterized on the basis of signal intensity, morphology, location and the vertebral segmental length.

In the patients who underwent axial T2- weighted imaging, lesions were further classified into three categories[1] based on the location of the abnormal signal intensity seen on axial T2-weighted image:(Fig2,3.4)

1) Holocord with or without peripheral sparing
2) Non-holocord

Degree and pattern of enhancement with gadolinium were recorded.

RESULTS

Of the 11 patients, 6 patients (55%) were female and 5 patients (45%) were male. The mean age was 35 years (range 15-53 years). Prodomal symptoms were present in 8 patients (Table 1).

With respect to clinical presentation , all patients had paraplegia and sensory deficit. Length of symptom onset to a maximal level was between 4 hours and 4 weeks.

Nine of eleven patients had cerebrospinal fluid (CSF) studies. Abnormal CSF studies were noted in 4 patients(45%) which were abnormal in 4 patients (36%) (Table1).

TABLE 1. Clinical Findings in Patients with IATM

Patient No./age(y) /sex	Length-of Symptom Onset	Prodomal Symptom and Time	Level of Sensory Deficit	CSF profile			
				Protein (mg/dl)	Sugar (mg/dl)	WBC Cell/mm^3	Differential Cell count (cell)
1. 47 F	14 d	Upper respiratoty tractinfection (URI) 2 wk. Earlier	C7-C8	-		-	-
2. 53 F	1 d	- None	T8	Normal	Normal	0	-
3. 15 M	1 d	- URI 2 wk. Earlier	T4	Increased (61 mg/dl)	Normal	55	L52, PMN 3
4. 30 F	7 d	- None	L2	Increased (64 mg/dl)	Normal	2	L2
5. 34 F	20 d	- Fever 1 mo.earlier	T4-T5	Normal	Normal	0	-
6. 34 F	30 d	- Minor trauma 2 mo. Earlier	T6	Normal	Normal	2	L2
7. 43 F	2 d	- Recurrent ATM (twice) 2 yr earlier	L1	Increased (77 mg/dl)	Normal	20	L18, PMN 2
8. 19 M	4 d	- URI 1 mo earlier	T8	-	-	-	-
9. 19 M	1 d	- Diarrhea 7 d. earlier	T10	Normal	Normal	0	-
10. 52 F	4 hr.	- None	L1	Normal	Normal	0	-
11. 43 M	9 d	- URI 2 wk. Earlier	-	Increased (145 mg/dl)	Increased (85/144)	1	L1

Normal CSF protein < 50 mg/dl
Normal CSF sugar < half of blood sugar level
Normal CSF white blood cell < 5 lymphocytes/mm^3)
L : lymphocyte,
PMN: Polymorphonuclear cell

The spinal cord MR findings were abnormal in 10 of 11 patients (91%);8 patients had a single lesion, 1 patient had two non-contiguous lesions and 1 patient had three non-contiguous lesions (Fig 1). No abnormality could be detected by MRI in one case. (Table 2)

Among 13 lesions from 10 patients, 11 lesions (85%) occurred in the thoracic cord, 1 lesion occurred in the cervicothoracic and 1 lesion involved the lower thoracolumbar cord.

Seven of 13 lesions (54 %) were more than two vertebral segments long. Three lesions were less than two vertebral segments long. Three lesions were one vertebral segment long.

Four (4/13) lesions (31%) had slight cord expansion, 8 lesions (69%) had no cord expansion and the other one showed cord atrophy.

The axial SE T2W image of the patient number 3 was disppeared. Twelve lesions in axial T2W images could be studied 8 lesions (67%) involved the majority of the cord in the cross

sectional area (holocord pattern) (Fig 2), 4 lesions (33%) involved focal non-specific region (non holocord pattern) (Fig 3,4).

Seven lesions were furthur evaluated with Gadolinium enhanced MR imaging. There was no evidence of enhancement in 3 lesions (43%). Four lesions (57%) had abnormal enhancement and all of them (100%) were diffused vague enhancement.

TABLE 2. MR Imaging Finding in Patients with IATM

Paitent	Spinal cord		Sl on T1W	Length (number of vertebral body)	Pattern on axial T2W	Contast enhancement pattern
No	Lesion location	Expansion				
1	T4-T5,T7,T9-T10	No	isointense	1 - 2	Holocord	-
2	T9-T10	No	isointense	2	Posterior cord but both GM and WM	None
3	T2-T8	No	isointense	8	No axial T2W	Diffuse vague
4	T11-T12	Yes	isointense	2	Holocord	-
5	C7-T1,T12	No	isointense	1 - 2	Holocord	None
6	Upper T	No	isointense	4	Holocord	Diffuse vague
7	T1-T4	Atrophy	isointense	4	Holocord	Diffuse vague
8	T5-T10	Yes	isointense	6	Holocord	-
9	T7-T8	Yes	isointense	1	Holocord	None
10	T12-L1	Yes	isointense	3	Anterior Gm	Diffuse vague
11	Invisible	No	isointense	0	-	None

Si = Signal intensity
GM = Gray matter
WM = White matter

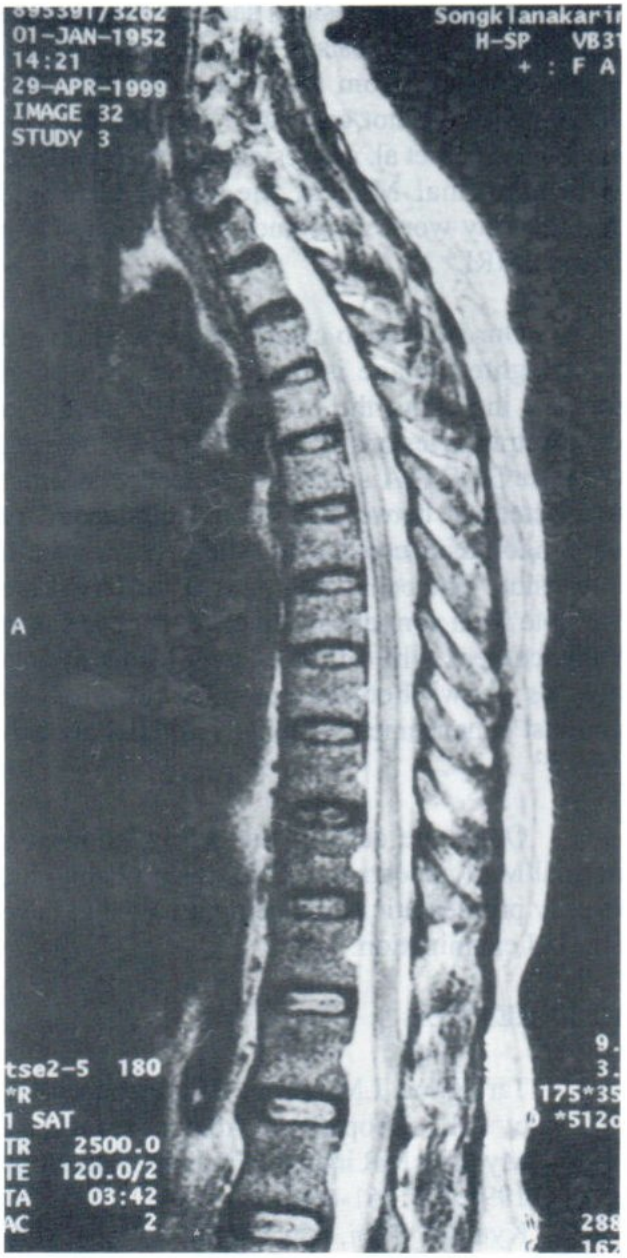

Fig. 1. Sagittal SE T2w image shows multiple non-contiguous hyperintensity lesion in mid and lower thoracic cord.

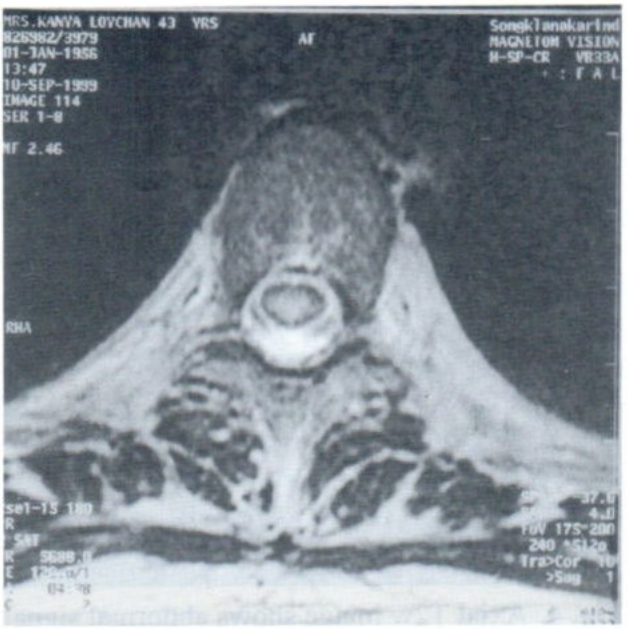

Fig. 2. Axial T2w image shows a holocord signal intensity abnormality in upper thoracic cord.

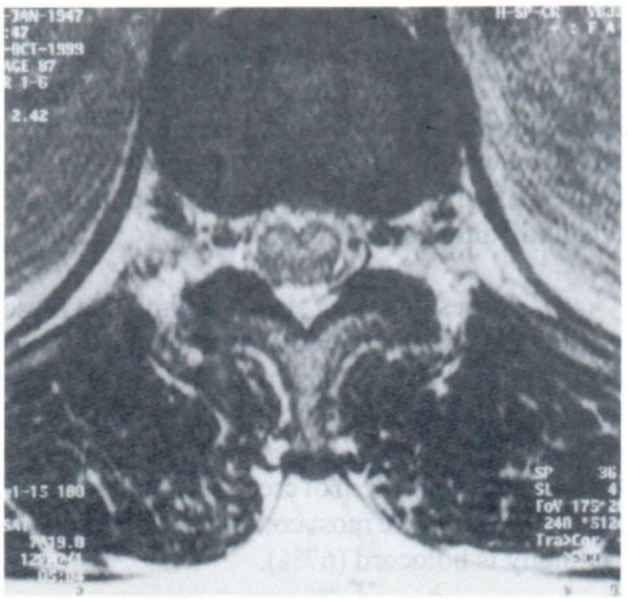

Fig. 3. Axial T2w image shows abnormal signal intensity predominate anterior gray matter in lower thoracic cord.

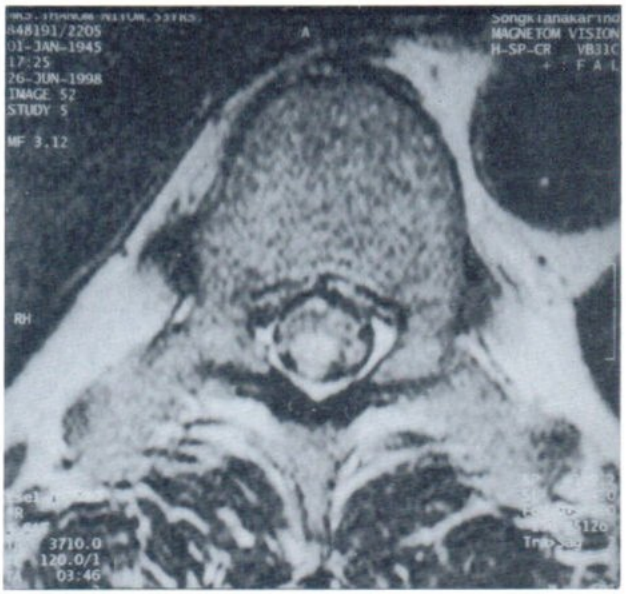

Fig. 4. Axial T2w image shows abnormal signal intensity involving predominate posterior cord in lower thoracic cord.

DISCUSSION

The diagnosis of IATM is based on clinical information. MRI, the best non-invasive imaging modality to demonstrate the spinal cord, has been widely used to exclude other possible causes of myelopathy such as neoplasm and epidural compression.

The results of our study are similar to those of previous reports.[1,2] Variable patterns from normal spinal cord appearance to abnormal high signal intensities within the affected cord are seen on axial T2 weighted images. There is no definite or characteristic pattern of cross-sectional involvement. However, the most common pattern seen in our study is holocord (67%).

Demonstration of the disease extending longer than 1 vertebral segment in the spinal cord was seen in most cases (86%). Differential diagnosis of a long spinal cord lesion may include syringomyelia, however clinical manifestations of these entities are different and syringomyelia can usually be clearly seen on both T1W and T2W images similar to a water signal intensity.

Whether the lesions seen by MRI can be related to the prognosis is still uncertain. Austin et al. conclude from their data that the MRI abnormality did not correlate with the prognosis,[3] but Scott et al. suggested that their patients with abnormal MRI of the spinal cord had significantly worse outcomes than patients with normal MRI.[4]

Our study also clearly shows that the SE T2 weighted image is much better than other images, including the post Gd-DTPA study, in demonstrating lesions in the spinal cord. However, the post Gd-DTPA study is still needed in order to differentiate between IATM and intramedullary cord neoplasm especially when there is cord expansion. The enhancing patterns of IATM are variable from non- enhancement to diffuse vague enhancement while that of neoplasms almost always shows heterogeneously pronounced contrast enhancement or focally nodular appearance.[1,2]

Only one case in our study, showed a normal MRI appearance. This was probably due to only problematic cases being selected to have an MRI examination.

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