

The Correlation Between the Clinical Presentation and the Radiological Appearance in Patients with Myelitis at Alshaab Teaching Hospital-Sudan

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Abstract: Acute transverse myelitis is the leading cause of non-compressive myelopathy, linking the clinical presentation with Magnetic Resonance Imaging (MRI) may aid in proper stratification of patients improving management, we aimed to study the correlation between the clinical presentation of acute transverse myelitis with MRI findings. This cohort, hospital-based study conducted at Alshaab Teaching Hospital, Sudan among patients with acute transverse myelitis, Participants signed a written informed consent then the clinical presentation was recorded and followed including symmetry and extent of the lesion, site of lesion, sensory involvement. Correlation between various clinical presentations and MRI findings was done. The ethical committee of Alshaab Teaching Hospital approved the research, and the Statistical Package for Social Sciences was used for data analysis. Out of 100 patients infections was observed in 25%, and autoimmunity in 8%, involvement of more than three segments of the spinal cord was commoner among patients with symmetrical and complete presentation, no significant difference was evident between patients with symmetrical and complete presentation, compared to partial asymmetrical presentation regarding the site of spinal cord involvement on MRI. Complete and symmetrical presentation are commonly associated with more than three segments involvement of the spinal cord, no significant difference was found between complete symmetrical presentation and partial asymmetrical presentation regarding the site of involvement on MRI.

Keywords: Transverse Myelitis, Radiological Finding, Sudan

1. Introduction

Acute transverse myelitis [ATM] has been reported as the leading cause of non-compressive spinal cord pathologies [1]. Transverse myelitis is an inflammatory process across the spinal cord that can damage the myelin, and a scar may develop resulting in loss of communication between the spinal cord and the rest of the body [2].

The term acute transverse myelitis denotes the presence of inflammation ruling out non-inflammatory causes; possible causes include infections, auto-immune disorders, inflammatory, vascular, and neoplastic and metastatic disorders [3]. ATM can occur as an isolated inflammatory disease, or as part of multifocal CNS demyelinating diseases

such as multiple sclerosis (MS), Neuromyelitis Optica (NMO) acute disseminated encephalomyelitis (ADEM), or it can also be associated with systemic rheumatological disorders. Some remain with no apparent cause after ruling out all possible causes on follow up and is referred to as idiopathic [4].

The clinical picture of transverse myelitis consist of ascending pattern of weakness and sensory dysfunctions involving the lower extremities; the upper limbs are not usually involved, abdominal or back pain may be associated, fever when present usually but not always denote infections [5].

Acute transverse myelitis (ATM), a subgroup of different medical conditions that lead to transverse spinal cord

syndromes, it could be idiopathic or inflammatory spinal cord disease. Idiopathic. ATM is diagnosed based on the following criteria: bilateral symptoms and signs attributable to spinal cord disease, the presence of focal cord inflammation by magnetic resonance imaging and cerebrospinal fluid studies, and the exclusion of many diseases, especially cord compression and "disease-associated ATM," as Sjögren disease. The presentation with sensory and autonomic dysfunctions with acute or subacute onset, progressing to the maximum neurological deficit in 4 h to 21 days, most of the cases improve in full or partial [6].

Radiology is of paramount importance to rule out spinal cord compression, and is one of exclusion criteria to diagnose idiopathic transverse myelitis; other exclusion criteria are Evidence of thrombosis of the anterior spinal artery, connective tissue disease, infection, optic neuritis, and multiple sclerosis [7].

The epidemiology of complete idiopathic transverse myelitis is uncertain and depends on the underlying pathology, previous studies in the United States of America, Europe and Israel ranged from 1-4 cases per million. The disease has a bimodal distribution of age presentation peaking at ages 10-19 and 30-39 years [8] [9].

Acute transverse myelitis is the leading cause of non-compressive myelopathy, linking the clinical presentation with Magnetic Resonance Imaging (MRI) may aid in proper stratification of patients improving management, No researchers have studied the association of the clinical features of acute transverse myelitis to the radiological picture in Sudan. Thus we conducted this survey, in the present study, we aimed to explore the correlation between the clinical presentation of acute transverse myelitis with MRI findings.

2. Material & Methods

This cohort hospital-based study conducted in Alshaab Teaching Hospital, Sudan during the period from April to December 2012. One hundred patients admitted with bilateral sensory, motor, and autonomic neurological dysfunction attributed to the spinal cord with or without optic neuritis and higher function involvement were approached, those with unilateral symptoms and symptoms of sudden onset were excluded as were those with spinal cord compression. Participants were asked to sign a written informed consent then interviewed by the researchers. A structured questionnaire was used, information collected include: demographic data, onset and mode of clinical presentation, past medical history, family history, Spinal Magnetic Resonance Imaging (MRI) with a magnet strength of 1.5 Tesla to assess the radiological appearance including both axial and sagittal planes with T1, and T2-weighted sequences, brain MRI in selected cases with axial, sagittal, and coronal with T1, and T2-weighted and FLAIR images, and the initial response to treatment.

ATM is diagnosed based on the following criteria:

- Bilateral symptoms and signs attributable to spinal cord disease.
- The presence of focal cord inflammation by magnetic resonance imaging and cerebrospinal fluid studies.

- Exclusion of other diseases, especially cord compression and "disease-associated ATM," as Sjögren disease.
- The presentation with sensory and autonomic dysfunctions with acute or subacute onset, progressing to the maximum neurological deficit in 4 h to 21 days, most of the cases improve in full or partial. The treatment is symptomatic and a corticosteroid to halt the inflammatory process. The diagnosis of specific inflammatory and autoimmune myelopathies (paraneoplastic myelitis and neuromyelitis optica spectrum diseases) is crucial to establish therapeutic strategies, and now possible with the use of specific biomarkers [6]

The ethical committee of Alshaab Teaching Hospital approved the research and the Statistical Package for Social Sciences version 21 was used for data analysis. The mean, standard deviation and frequencies were defined. The chi-square test was used to compare categorical variables, and P-value of < 0.05 considered significant.

3. Results

Out of 100 patients with acute transverse myelitis 59% were females, their ages ranged from 15-75 with a mean of 39.17 ± 12.78 years, antecedent illness was present in 25%, the majority [70%] had an acute presentation. The clinical presentation peaked in 1-6 days in 39% of patients, and in 1-4 weeks in 47% of patients, more than two-thirds [75%] presented with sensory symptoms, followed by lower limb weakness [68%], and sphincteric disturbances in [66%]. The pattern of progression was ascending in the majority of patients [66%], followed by the circumferential [27%], while ascending pattern was detected in [11%]. More than one-fifth of patients [21%] had significant past neurological history. The commonest underlying cause was infection [25%], followed by autoimmune disorders in [8%] Table (1). Hyperintense lesion in the spinal MRI was the commonest abnormality and detected in [75%] of patients, the most common region affected was the dorsal segments of the spinal cord [49%], followed by the cervical [8%]. Table [2] depicted other spinal MRI characteristics.

In the current data hyperintense lesion involving >2/3 of the spinal cord was commoner incomplete, and symmetrical presentation as compared to partial and asymmetrical [32% vs. 24%, and 30% vs. 26% respectively with on significant statistical difference Table [3]. The dorsal column was affected more incomplete and symmetrical involvement [34% vs. 15%, and 39% vs. 10% respectively with significant statistical difference Table [4]. Table No [5] illustrated the length of spinal cord involved in correlation to pattern of clinical presentation in which; more than 3 segments of the spinal cord were involved in 29% in complete involvement and 26% in partial with no significant statistical difference, while it was present in 28%, and 27% in symmetrical and asymmetrical involvement respectively. In the minority of patients [15%] in whom the MRI brain was done it was normal, more than two-thirds of patients improved with methylprednisolone [64%], and no improvement was observed in [35%].

Table 1. Basic clinical characteristics of the study group.

Character	%
Males	41
Females	59
Antecedent febrile illness	25
Onset of clinical features	
Acute	70
Sub-acute	27
Chronic	3
Peak of clinical features	
1-6 days	39
1-4 weeks	47
More than four weeks	14
Symptoms	
Backache	57
Lower limb weakness	68
Four limb weakness	32
Sensory involvement	75
Sphincteric disturbances	66
Pattern of progression	
Ascending	62
Descending	11
Circumferential	27
Past medical history	21
Causes	
Autoimmune disease	8
post infectious	25

Table 2. MRI characteristics of the study group.

Character	No %
Abnormal scan according to time interval	
Less than five days	12 (12%)
More than five days	73 (73%)
Radiological appearance	
Cord swelling	10 (10%)
Hyperintense>2/3 of cord	56 (56%)
Hyperintense>1/2 cord	19 (19%)
Normal finding	15 (15%)
Site of the lesion	
Dorsal	49 (49%)
Cervicodorsal	21 (21%)
Cervical	8 (8%)
Whole spinal cord	7 (7%)
Normal	15 (15%)
Length of vertebral segments involved	
<3 segments	30 (30%)
>3 segments	55 (55%)
Normal scan	15 (15%)

Table 3. Correlation between the spinal cord dysfunction and symmetry of the clinical signs and MRI.

Character	Normal %	Hyper intensity>2/3 of cord	Hyper intensity<1/2 of cord	Cord swelling
Cord Dysfunction				
Complete	9	32	9	7
partial	6	24	10	3
the symmetry of signs				
Symmetrical	12	30	12	12
Asymmetrical	3	26	7	7

Table 4. correlation between the pattern of spinal cord dysfunction and the site of the lesion on MRI.

Character	Normal %	Cervical %	Dorsal %	Cervico-dorsal %	Whole cord %
Cord Dysfunction					
Complete	9	0	34	9	5
Partial	5	8	15	12	2
Degree of symmetry					
Symmetrical	12	1	39	7	1
Asymmetrical	3	7	10	14	6

Table 5. correlation between the pattern and degree of spinal cord dysfunction and length of spinal segments involved.

character	Normal scan %	<3 segments involved %	>3 segments involved %
Cord Dysfunction			
Complete	9	19	29
partial	6	11	26
Degree of symmetry			
Symmetrical	12	20	28
Asymmetrical	3	10	27

Table 6. Brain MRI of the study group.

MRI	%
Normal	15
abnormal	0
Not done	85

Table 7. Response to therapy among the study group.

Response to treatment	%
Improvement	64
No improvement	35
Treatment not given	1

4. Discussion

Acute transverse myelitis, a fragment of disseminated vasculomyelinopathy is pathogenetically similar to acute disseminated encephalomyelitis. The hallmark acute transverse myelitis is perivenular inflammation and surrounding demyelination MRI is the investigation of choice investigation to detect such lesions in the spinal cord. MRI imaging may be normal in early stages of the disease, and no signal intensity is detected, later as the illness progress local enlargement of the spinal cord and increased signal intensity on long repetition time/echo time sequences are shown [10].

In the present study, the majority of patients had their MRI done more than five days from the symptoms onset, with an abnormality detected in 85%, similar to Prabhakar study [11]. In the current study high signal intensity lesions occupying >2/3 of the spinal cord was evident in 56% of patients by Murthy et al. [12] in India, who concluded similar findings [61.5%].

The present data found that the dorsal spines were involved in the majority of MRI [49%], by previous researchers who concluded similar results [11]. Previous researchers found similar results [3]

In contradiction to then present finding De Seze et al. [14] found that the majority of lesions were in the cervical segments. In the current research involvement of >3 segments of the spinal cord was observed in 55% of patients in similarity with Choi et al. [15] who reported that >3 segment involvement was found in 54% of patients with transverse myelitis, particularly those with Neuromyelitis Optica.

Regarding the pattern of presentation, the complete and symmetrical presentations were commoner in patients with hyperintense areas involving more than two-thirds of the spinal cord, while partial, and a symmetrical presentations were commoner among hyperintense MRI lesions involving < 1/2 of the spinal cord similar to previous literature [11, 15].

In the present study, no statistically significant difference was evident between the clinical presentation and the site of the lesion; one plausible explanation is that the presence of

spinal lesions involving multiple levels can lead to versatility in clinical features [16].

5. Conclusion

Infections was detected in 25%, of the study group, involvement of more than three segments of the spinal cord was commoner among patients with symmetrical and complete presentation, no significant difference was evident between patients with symmetrical and complete presentation, compared to partial asymmetrical presentation regarding the site of spinal cord involvement on MRI. Complete and symmetrical presentation are commonly associated with more than three segments involvement of the spinal cord, no significant difference was found between complete symmetrical presentation and partial asymmetrical presentation regarding the site of involvement on MRI.

Limitations of the study are the small size of the survey group, and the study was conducted at a single tertiary center so generalization cannot be insured, further larger multicenter studies are needed.

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