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ARTICLE

Flail leg syndrome misdiagnosed as inflammatory myopathy a case report

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Abstract

Objective: To investigate the development and clinical characteristics of flail leg syndrome (FLS) and improve clinicians' recognition ability of the disease. MethodWe reviewed the clinical data, electromyography, cerebrospinal fluid test, and lumbar MRI of a patient diagnosed with flail leg syndrome(FLS) in the seventh Affiliated Hospital of Sun Yat-sen University. Results: Clinical symptoms of the patient limited in both lower limbs, including asymmetric distal muscle weakness and atrophy with conceal onset and slow development. There were also occurrences of increased tendon reflexes and muscle soreness as the disease progressing. Electromyography showed that the amplitude of motor nerve conduction of both lower limbs decreased even disappearedindicating neurogenic injury.In addition, patient's blood creatine kinase level was found slightly increased. Conclusion: Flail leg syndrome is a variant type of ALS. It is relatively rare in clinical practice and usually shows slow progress. This case study would be helpful for clinicians to improve the diagnostic ability of FLS.

Keywords: Motor neuron disease MND Amyotrophic lateral sclerosis ALS Flail leg syndrome FLS

Motor neuron diseaseMND, also known as "Charcot disease" or "Lou Gehrig disease", is a neurodegenerative disease that selectively involves motor neurons in cerebral cortex, brain stem and spinal cord. Its pathogenic mechanism remains unclear. [1]There are four clinical types of MND, including amyotrophic lateral sclerosis (ALS), progressive muscular atrophy (PMA), progressive bulbar palsy (PBP) and primary lateral sclerosis (PLS).

ALS is the most common type. It affects both upper and lower motor neurons, and shows rapid progress of muscular atrophy and respiratory muscle weakness.FLS is a variant type of ALS , symptoms of which limited in lower limbs and it progresses slowly in a long time after disease's onset. [2]Here we report a case of FLS that admitted in the seventh

Affiliated Hospital of Sun Yat-sen University in May 2022. We summarized its clinical characteristics in combination with published literatures.

1. clinical data

1.1 Basic information

A 53-years-old male patient was admitted in the Department of traditional Chinese medicine of our hospital in May 2022, with a complaint of " left lower limb weakness for 1 year and right lower limb weakness with atrophy for half a year". Later, his blood creatine kinase level was found elevated, so he was transferred to the Department of neurology to rule out the possibility of inflammatory myopathy.

The patient showed left foot weakness without inducement one year ago, and it gradually developed into a foot drop-like weakness that was prone to be tripped. The symptoms were progressive. There was no numbness of the left lower limb, weakness of other limbs, defecation or sexual dysfunction.

Similar symptoms occurred gradually in the right foot half a year ago, but with severe pain in bilateral gastrocnemius and thigh muscles after turning over or strenuous exercise. It was accompanied with muscle atrophy of lower legs, and visible fasciculation of both lower limbs. No recognized family history with muscular atrophy of the patient. No significant personal history, or medical history, neither.

1.2 Physical examination

Neurological examination showed normal higher nervous activity and cranial nerves function . The muscle strength of both upper limbs was grade 5/5, with normal muscle tension. No significant muscle atrophy of both upper limbs and paraspinal muscles. The tendon reflex of the left upper limb increased slightly, when comparing with the right upper limb. The muscle strength of the proximal end of the left lower limb was slightly reduced, strength of bilateral foot dorsiflexion decreased, too. The left foot dorsiflexion was grade 1/5, and the right one is grade 2-3/5. Both feet were sagging. Suspected muscle atrophy was found in the left lateral thigh and the left posterior calf muscle group, while significant muscle atrophy was found in bilateral anterior tibial, with more severe on the left side than the right side. The sensory examination showed no abnormality. The cross threshold gait, the Romberg sign, or the Bilateral Pasteur's sign were negative.

1.3 Supplementary Examination

The blood creatine kinase (CK) was 517 U / L (50-310). Cerebrospinal fluid tests including appearance, biochemistry, and cytology showed no abnormality. Results of urine immunofixation electrophoresis, systemic lupus erythematosus, vasculitis, thyroid function, and tumor markers tests werenormal.

Electromyography examination revealed no peripheral nerve injury, also no neurogenic or myogenic injury of both upper limbs. For both lower limbs, motor conduction of bilateral tibial nerves were normal. Compound muscle action potential (CMAP) amplitude was decreased in extensor digitorum brevis and tibialis anterior muscle of left common peroneal nerve, and popliteal fossa microcephaly conduction velocity was decreased in

extensor digitorum brevis. No positive waveform was recorded in the right common peroneal nerve and extensor digitorum brevis.A large number of spontaneous potentials were recorded in the left tibialis anterior muscle and the right tibialis anterior muscle at resting state. The average time limit of slight contraction motor unit potential(MUP) was widened, and the recruitment of strong contraction was mixed or single mixed phase;.There were a few spontaneous potentials at resting state of left gastrocnemius muscle, and the recruitment of strong contraction was mixed phase;.Spontaneous potentials were seen in the right gastrocnemius muscle at resting state, and vigorous contraction and recruitment showed mixed phase. The left quadriceps femoris showed a small number of spontaneous potentials at resting state, the average duration of slight contraction MUP was widened, and the recruitment of strong contraction showed a simple phase.No spontaneous potential was found in the right quadriceps femoris at rest state. The average time limit of light contraction MUP was widened, and the recruitment of strong contraction was single mixed phase. The left abductor digiti minimi was in the normal range. It is suggested that neurogenic damage of both lower limbs (L4-S1 level, anterior horn or anterior root damage is possible). Evoked potentials: 1. Brainstem auditory evoked potential showed that both sides were in the normal range;.2. Visual evoked potential showed that both sides were almost normal.3. Somatosensory evoked potential of upper and lower limbs showed that both sides were within the normal range.

Cranial MRI scan found a few small ischemic foci in white matter of bilateral frontal lobe. No significant abnormality of cranial MRA. Lumbar MRI scan revealed degeneration of Lumbar 1/2-lumbar 5/sacral 1 intervertebral disc, bulging with slightly right posterior protrusion of Lumbar 2/3 intervertebral disc, and slightly bulged of Lumbar 3/4 and 4/5 intervertebral discs. There was Lumbar bone hyperplasia found. Cervical MRI scan revealed degeneration of cervical intervertebral discs, and slightly protruded backward of cervical 3/4-6 /7 intervertebral discs.

1.4 Diagnosis and treatment

The patient has no complaints of drinking water choking, dysarthria or dysuria. After excluding the possibility of being multifocal motor neuron disease, demyelinating disease, immune related peripheral nerve injury, paraneoplastic syndrome, Kennedy disease and poliomyelitis, he was diagnosed as “FLS”, and received neurotrophic therapy with vitamins B and general symptomatic treatments.

2. Discuss

FLS was firstly reported by Pierre Marie and Patrikios In 1967[3]. Then in 2009, wijesekera firstly defined the diagnostic criteria, with both support and exclusion criteria for FLS. [4] The main clinical characteristics of FLS are muscle atrophy or weakness at the distal end of the lower limb, with concealed onset and slow progress. At the early stage, there could be no clinical signs of upper motor neurons injury, neither muscle weakness at the distal end nor disappearance of tendon reflexes. And as the disease’s developing, patients may have complaints of subjective hypoesthesia, because of which FLS often misdiagnosed as peripheral neuropathy. [5]

The classic type of ALS often manifests as chronical and progressive development. Its clinical symptoms or physical signs usually start and develop within a specific region, and then spread to other regions. Upper and lower motor neuron would be both involved. And diagnostic criteria also require for evidence of simultaneous injury of upper and lower motor neurons in at least one region. [4]

Except for the classic type with limb onset and both upper and lower motor neurons involving, ALS also has a phenotype with medulla oblongata onset and rapid progression. Physical signs of lower motor neuron injury of FLS are prominent. Although the injury of upper motor neuron could exist at the same time, its affected region is usually not the same as the lower motor neuron injury. On the contrary, classical ALS affected both upper and lower motor neuron injury within the same region.The incidence of FLS in men and women is different from that of classic ALS. The male to female ratio of FLS is 1 6:1, while 1.5:1 of classic ALS. FLS shows a relatively benign disease process than classic ALS. FLS patients have a significantly higher 5-year survival rate than classic ALS, and later use of ventilator. Specifically, the median survival period of FLS is 69 months with a 6% 5-year survival rate, while the median survival period of classic ALS (lower limb onset)is 35 months with a 20

Wijesekera proposed the clinical characteristics of FLS firstly, which highlighted the lower limbs, including progressively aggravated muscle weakness and atrophy at the distal end, tendon reflex weakening, disappearing or increasing , but without increased muscle tension or myoclonus. The clinical signs must be limited in the lower limbs for more than 12 months to meet the support criteria. Exclusion criteria: only proximal weakness or muscular atrophy of lower limbs without distal part involvement. Table 1: comparison between classic ALS and FLS. [4]

Symptoms of our patient started with muscle atrophy and weakness of the distal end of the left lower limb, and then involved the right lower limb. Electromyography showed denervation potential of the lumbar spinal cord region . And the increased tendon reflexes of both lower limbs suggested injury of the pyramidal tract. There have been one region where the upper and lower motor neurons were both affected, which was consistent with the diagnostic criteria of clinical possible ALS. The patient showed only muscle weakness and atrophy in both lower limbs more than 1 year after onset, therefore, he was diagnosed as FLS.

The patient's blood CK level was slightly increased. However, the pathogenesis of elevated blood CK level in FLS is unknown. As it was reported, the mechanisms may be (1) mild myogenic lesions; [6] (2)Abnormal Skeletal muscle metabolism and increased adenosine triphosphate activity in mitochondria; [7](3) The permeability of CK in neurogenic atrophic muscles was enhanced. [8] Due to the low incidence of FLS, there is no independent study on its treatment. The relevant treatments usually refer to classic ALS, such as riluzole and edaravone. In the late stage of classic ALS, the occurrence of dysphagia would requires for percutaneous gastrostomy and respiratory failure requiring for noninvasive respiratory support. However, gastrostomy and non-invasive ventilator usage are rarely needed in FLS patients.[4]

The short average survival period of ALS patients often brings disastrous consequences to patients and their families. FLS patients have a relatively long survival period, early diagnosis

Comparison between classic ALS and FLS

	Classic ALS	FLS
Age of onset (years)	50	55
Male: Female	1.5:1	1~6:1
Affected nerve of lower limbs	Superior and inferior motor neurons	Lower motor neurons
Muscular atrophy limbs	Tongue muscles, neck muscles, Upper limbs, back muscles, pectoralis and abdominal muscles	Distal muscles of lower
support	Myotonia or myoclonus, pathological signs	Pathological signs of lower limbs or active deep reflexes without increased muscle tension or myoclonus
exclude	> 12m Confined to one area	<12m Confined to one area
5-year survival rate	20%	60%
medicine	Riluzole	Riluzole
Ventilator utilization rate	Common	Rare
Gastrostomy rate	Common	Rare

ALS: amyotrophic lateral sclerosis; FLS: flail leg syndrome

of which would be meaningful for patients to reduce pressure and pain, also improve their treatment coordination. The specificity of FLS diagnosis discriminated from classic ALS, would provides the possibility to explore the treatment of FLS.

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