

## Asymmetrical Onset of Leg Amyotrophic Diplegia (LAD): A Case Report

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### Case Presentation

Progressive muscular atrophy (PMA) comprises approximately 10% of patients with motor neuron disease (MND). Some of the patients initially presenting with PMA will develop, when followed over time, upper motor neuron findings leading to the diagnosis of ALS. True PMA cases represent a pure lower motor neuron presentation of sporadic motor neuron disease and are in a spectrum with ALS and PLS. While PMA typically affects both the arms and legs, some patients have predominantly upper extremity involvement and others may have selective leg weakness referred to as brachial amyotrophic diplegia (BAD)<sup>1,2</sup> and leg amyotrophic diplegia (LAD).<sup>3</sup> These cases of progressive muscular atrophy remain restricted to a body region for extended periods and are considered slow regional variants of motor neuron disease. LAD is a variant of progressive muscular atrophy (PMA) where weakness is confined to the legs for at least two years, and there are no upper motor neuron signs.<sup>4</sup> An LMN syndrome confined to the leg was first described by Pierre Marie and his student Patrikios in 1918 and was known as the pseudopolyneuritic variant of ALS, the Marie-Patrikios form, or the peroneal form of ALS. Here we present another case of LAD for the neuromuscular literature.

A 42-year-old right-handed female who presented with low back pain and right leg weakness had difficulty walking which slowly progressed to bilateral leg weakness over thirty months. She stated that her weakness had been getting worse after recovering from COVID-19 infection about nine months prior. The patient initially noticed right leg weakness about 30 months ago with catching of the toes on uneven surfaces and difficulties in climbing up stairs, moreso than descending stairs. The patient denied dysphagia, dyspnea, dysarthria, trouble with balance, bowel/bladder incontinence, or sensory abnormalities. She denied any past medical history aside from her history of mild-moderate COVID-19 infection and had not noticed any long-term sequelae from that illness. The patient denied taking any medications.

On physical exam, the patient was observed to be using bilateral crutches for walking. Cranial nerve examination was normal and upper extremity muscle strength was full. On manual muscle testing, right hip flexion -4/5; and left hip

flexion 4/5; Right hip abduction -4/5; left hip abduction was 4/5; Ankle dorsiflexion (ADF) -4/5 right and 4/5 left; ankle inversion and eversion -4/5 right and 4/5 left; Bilateral ankle plantar flexion (APF), knee flexion and extension were normal. In summary, there was an asymmetric pelviperoneal pattern involvement, with relative sparing of knee extension and/or ankle plantar flexion with bilateral distal leg atrophy. Sensory examination was normal to pinprick, vibration, and proprioception. The upper extremities had normal deep tendon reflexes (DTRs); however, the lower extremity DTRs were unobtainable bilaterally with absent Babinski sign, jaw jerk and Hoffmann reflexes.

All metabolic, toxic, infectious, inflammatory, vasculitis profiles, and CSF examinations (including oligoclonal band and CSF IgG index) were normal. Brain, cervical, thoracic and lumbosacral MRIs were normal as well. On electrodiagnostic study (EDX), there was mild reduction in amplitude of lower limb compound motor action potentials (CMAPs) with right leg more than left without sensory abnormalities. There were also reductions in amplitude of both lower limb F-waves, H-reflexes, neurogenic MUAPs, and recruitment motor unit action potentials (MUAPs) on lower limb muscles with rare positive sharp waves only on distal leg muscles without fasciculation. Upper limbs, cervical and thoracic paraspinal and bulbar muscles EDX study were normal. She was diagnosed with the LAD (leg amyotrophy diplegia) variant of progressive muscular atrophy.

### Discussion

LAD is a leg onset variant of progressive muscular atrophy (PMA). LAD weakness is confined to the legs for at least two years without upper motor neuron signs. The natural history of LAD differs from typical forms of ALS and PMA. LAD is a slowly progressive disorder. An asymmetric pelviperoneal pattern of weakness should heighten the suspicion for LAD.<sup>4</sup> Recent descriptions of regional variants suggest some patients have part isolated to a single spinal region for many years, including leg amyotrophic diplegia.<sup>5</sup> Leg weakness is a presenting symptom in about one third of ALS cases. Therefore, it is impossible to predict if there will be a slow clinical course during the early stages. However, LAD should be a consideration when weakness remains restricted to the legs for two or more years in the absence of upper motor neuron signs thereby failing to fulfill El Escorial criteria for ALS.<sup>6,7</sup>

In 2009, Wijesekera *et al* described the flail leg syndrome (FLS) which is characterized by progressive distal leg weakness and atrophy.<sup>5</sup> While FLS weakness allows for leg restriction for one year and pathologic tendon reflexes, LAD is defined as the absence of spread to other myotomes

or upper motor neuron signs for at least the first two years.<sup>8</sup> Lower extremity regional motor neuron disorder can be manifested by Flail Leg Syndrome (FLS) with more distal and symmetrical lower extremity atrophy and weakness (S1-S3 involvement) or Leg Amyotrophic Disorder (LAD) with more asymmetrical pelviperoneal pattern of weakness and atrophy (L4-L5 involvement).

There are multiple questions that remain regarding MND. Further research is required to elucidate whether there are any differences between upper motor neuron cell body and lower motor neuron cell body involvement in MND. It is also poorly understood what leads to the asymmetric vs symmetric pattern in MND and what factors may contribute to the susceptibility of lower or upper motor neuron cell bodies.

## References

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