Multiple system atrophy - cerebellar type: case report

## Abstract

Multiple system atrophy is a rare neurodegenerative disorder affecting the pyramidal, autonomic, and cerebellar tracts. Multisystem atrophy should be considered in adults with progressive motor or autonomic dysfunctions. Clinical manifestations vary depending on the system, including bradykinesia, tremor, rigidity, cerebellar ataxia, and autonomic failure are the main features. Depending on the initial predominant manifestation, multisystem atrophy is classified as the Parkinsonian type (MSA-P) and the cerebellar type (MSA-C). Our patient presented with progressive loss of balance, rigidity, slurred speech, choking episodes, and loss of morning tumescence for four years, suggesting autonomic and cerebellar involvement.

Keywords: multiple system atrophy, neurodegenerative disorder

## Introduction

Multiple system atrophy is a neurodegenerative disease that affects adults and is common in males (1, 2). The age of onset of MSA (multiple system atrophy) varies across studies. According to Köllensperger M et al. from 437 patients recruited from 19 European MSA study group centers, the mean age of onset was 57.8 years. parkinsonian type (MSA-P) was reported in 68%, and cerebellar type (MSA-C) in 32 % of patients (3). In a systematic review by Ben-Shlomo et al. of 433 pathologically confirmed MSA cases, the mean age of onset was 54.2 years (ranges,31-78) and survival was 6.2 years(4). Based on the initial predominant clinical manifestation, MSA is classified as Parkinsonian-type (MSA-P) characterized by akinesia/bradykinesia, rigidity, postural instability, cerebellar type (MSA-C) manifesting as gait ataxia, limb ataxia, dysarthria or mixed MSA with clinical features of both parkinsonian and cerebellar types. Two-thirds of patients have action or postural tremors, referred to as mini poly-myoclonus(5). Dysautonomia, such as urinary incontinence, erectile dysfunction, and orthostatic hypotension, are features of both Parkinsonian-type and cerebellar-type MSA(1). Sleep abnormalities are also common in multisystem atrophy. In a retrospective analysis of 45 patients with MSA performed by Rekik S, et al. 62.2% had sleep and breathing abnormalities(6). Unlike Parkinson’s disease and atypical Parkinsonian disorders, cognitive function is usually preserved in multiple system atrophy, possibly due to less cortical involvement in MSA(7).

Atrophy of the putamen, pons, middle cerebellar peduncles, and cerebellum, hyperintense T2 signal in the shape of a cross within the pons referred to as “hot cross bun” sign, and high apparent diffuse coefficient [ADC] values) in the putamen and middle cerebellar peduncles are the major MRI findings, however, the above findings are not pathognomic for this neurodegenerative disorder (8). Most patients become wheelchair-dependent within 5 years and die in the first 10 years after disease onset, showing dramatic disease progression (9).

## Case presentation

55 years old male patient presented to our neurology clinic with progressive loss of balance, gait abnormality, slurred speech, urinary urgency, nocturia, incontinence, loss of morning penile erection, and rigidity. These symptoms started 4 years ago; however, in the past 3 months, he developed choking episodes, intermittent hiccups, difficulty speaking at a regular pace, and slurred speech, signifying recent progression of the disease. He visited multiple healthcare facilities and levodopa/carbidopa 250/50 mg twice a day, without significant improvement; rather, developing significant side effects, such as irritability, anger, and aggressiveness, which prevented an increase in the dose.

On physical examination, his blood pressure was 130/80 mmHg (both in sitting and standing positions), heart rate was 92 beats/min, regular (both in sitting and standing positions), and respiratory rate was 16 breaths/min, with a regular breathing pattern.

Neurologic examination revealed motor power of 4+/5 in the left upper extremity muscle groups; power in other muscle groups was normal; exaggerated deep tendon reflexes with clonus at the bilateral knee and ankle with upgoing plantar reflex. He also had cogwheel-type rigidity in the left upper extremity and intention tremor in both hands. Cerebellar coordination abnormality was also observed as he was unable to perform finger-to-nose, heel-to-shin, and tandem walk tests properly. Cerebellar gait disturbance was observed with impaired gait velocity, stride length, slow swing speed and stance time. The results of cranial nerve examination and other systemic examinations were unremarkable.

Brain MRI showed marked pontocerebellar atrophy with “hot cross bun “sign suggestive for neurodegenerative process (figure1,2 and 3). Other laboratory investigations, including complete blood count, renal function test, liver enzymes, fasting blood sugar levels, and serum electrolytes (Na+, K+, Mg+2, Ca+2, Cl- phosphate), were normal. Serological tests for HBSAG, HCV-AB, VDRL, and PICT were also negative. His serum vitamin B12 level was within the normal range (705.3 pg. /ml), thyroid function tests were also normal (TSH-1.3 IU/ml, free T4-21.1ng/dl, free T3-2.28 pg. /ml)

## Treatment

He started physiotherapy for balance and strength along with speech therapy. Education and counseling regarding intermittent catheterization were also provided.

## Outcome and follow up

The patient is still attending speech therapy and physiotherapy, but no significant improvement

## Discussion

Multiple system atrophy is atypical Parkinson’s plus syndromes with a multisystem, sporadic, and unknown etiology characterized by different degrees of four cardinal clinical features, such as parkinsonism, cerebellar dysfunction, autonomic failure, and pyramidal signs. The disease is also characterized by poor response to levodopa (1). Cell loss in the striatonigral and olivopontocerebellar regions of the brain and spinal cord, along with many characteristic glial cytoplasmic inclusions (GCIs) composed of fibrillized alpha-synuclein proteins (referred to as primary alpha-synucleinopathy), are neuropathological hallmarks of multiple sclerosis (MSA).

There are two primary forms of multiple system atrophy: parkinsonian and cerebellar (MSA-P and MSA-C, respectively). Although the two varieties are quite similar, the primary distinction between them is the symptoms that the patient exhibits while being diagnosed (10).

Compared to MSA-C, MSA-P is more prevalent and is distinguished by the following symptoms: stiff muscles, tremors, bradykinesia, trouble bending limbs, and issues with balance and posture (10). In patients with MSA-C, movement and coordination are impaired, speech is slow and slurred, visual disturbances are noted, and some individuals have difficulty in swallowing or chewing (10). Despite their distinct features, MSA-P and MSA-C share symptoms of autonomic dysfunction, including erectile dysfunction, uncontrolled excessive or absent sweating, orthostatic hypotension, urinary dysfunction, and in certain cases psychological illnesses (2,10).

Multiple system atrophy is difficult to diagnose, and most patients are diagnosed with idiopathic Parkinson’s disease early in the clinical course. MSA diagnosis is based on clinical features. Definitive diagnosis can only be made through postmortem histological examination. High-density glial cytoplasmic inclusions (GCIs) associated with degenerative changes in the nigrostriatal and olivopontocerebellar tracts confirm MSA. (14,15).

Our patient presented with 4 years history of progressive loss of balance, gait abnormality, slurred speech, urinary incontinence, loss of morning penile erection, and rigidity of the left upper extremity. Cerebellar signs, such as heel-to-shin, finger-to-nose, and tandem walking, were positive with bilateral intention tremors of his hands. The Babinski sign was observed in both lower extremities, with hyperreflexia and ankle clonus. His laboratory tests were unremarkable, and his MRI showed marked atrophy of the cerebellar peduncles, pons, and cerebellum, with the typical hot-cross bun sign in the pons. Since our patient predominantly presented with cerebellar features with autonomic nervous system dysfunction together with typical MRI features, a probable diagnosis of MSA-C was considered.

According to a study by Watanabe et al., the typical durations were 3, 5, 8, and 9 years from the start of symptoms to the point at which a person needed assistance to walk, use a wheelchair, remain bedridden, or pass away, respectively (11). Studies have shown that the majority of patients with MSA die from secondary complications of the disease, including aspiration pneumonia, and pulmonary embolism (11). The cause of multiple system atrophy (MSA) remains unknown and no current therapy can reverse or halt disease progression. Most of the therapeutic options include symptomatic treatment. For approximately one-third of patients with MSA, L-dopa is a successful treatment for parkinsonism symptoms; for MSA-C, physical therapy is the best course of action.

When treating patients' symptoms, the goal should be to address issues that lower their quality of life, such as depression, poor self-control, and motor impairment (12).

## Conclusion

We report the case of a 55-year-old man with MSA-C who was diagnosed after 4 years with typical symptoms and signs with supportive evidence of MRI features, according to the second consensus on the diagnosis of MSA. Although MSA does not have treatment, pharmacological and non-pharmacological therapies for symptom control and improvement in quality of life are recommended.

## Lists of abbreviation

ADC-apparent diffusion coefficient

GCIs-glia cytoplasmic inclusions

HBSAG-hepatitis B surface antigen

HCV-AB-hepatitis C antibody

L-dopa-levodopa

MG-milligram

MRI-Magnetic resonance imaging

MSA-C-Multisystem atrophy-cerebellar

MSA-P-Multisystem atrophy-multisystem-atrophy parkinsonism

PICT-provider initiated counseling and testing

TSH-thyroid stimulating hormone

VDRL-venereal disease research laboratory

# Declarations

## Ethics approval and consent to participate

There are no ethical concerns about this case report.

## Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent form is available for review by the Editor-in-Chief of the journal.

## Availability of data and materials

All of data and materials for this case report are available from corresponding author.

## Competing interests

We declare that are no competing interests.

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## Authors' contributions

## Gebeyehu Tessema Azibte: writing, reviewing, and editing. Bereket Abraha Molla: Writing and reviewing the original draft. Sebhatleab Teju Mulate: Review and patient fellow-up. Zekarias Seifu Ayalew: writing and reviewing. Selam Kifelew Melkamu: Supervision and patient follow-up.

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