Series for Healthcare professionals

Multiple System Atrophy Trust
Founded by Sarah Matheson

A guide to multiple system atrophy for: Physiotherapists

This document serves as a guide to physiotherapists working with patients with multiple system atrophy (MSA). It draws on available literature in MSA, Parkinsonôs disease and other atypical Parkinsonism disorders. It does not cover aetiology, epidemiology, neuropathology and medical management in any depth. Further reading on these topics and others can be accessed via the list of resources (including the MSA website), given at the end of the document.

The Multiple System Atrophy Trust (MSA Trust) produces a series of specialist MSA factsheets for health professionals to enable them to improve the treatment people with MSA receive. Other factsheets can be found on our website: www.msatrust.org.uk

The Multiple System Atrophy Trust (MSA Trust) is the UKôs main charity supporting people with MSA. As well as helping people who have MSA, the Trust supports anyone affected by the disease, including carers, families, friends and health professionals.

The Trust employs three specialist nurses, manages a telephone and email advice service and runs a UK-wide network of support groups. It provides up-to-date literature for people affected by MSA and for health professionals. It also funds vital research to find the cause, and one day, cure for MSA.

To ensure services are accessible to everyone, the Trust is committed to providing its services free of charge. The MSA Trust is a charity funded entirely on voluntary donations.

The MSA Trust is always keen to receive feedback about the information it produces, please email support@msatrust.org.uk with any comments.

Introduction

MSA is a rare progressive neurological disorder that affects adult men and women and leads to premature death. Currently, there is no known cause or cure. MSA causes degeneration or atrophy of nerve cells in several (or multiple) areas of the brain which results in problems with movement, balance and automatic functions of the body such as swallowing, bowel, bladder and blood pressure control.

Globally, around five people per 100,000 have MSA which equates to almost 3,000 people living with MSA in the UK [1]. Parkinson's disease is about 45 times more common, affecting about 200 per 100,000 in the UK [2].

MSA usually starts between the ages of 50-60 years, but it can affect people younger and older. MSA does not appear to be hereditary although current research is examining whether or not there is a genetic predisposition to develop the disease. It affects both sexes equally [3].

Neuropathology

MSA falls within the entity of the spectrum of oligodendrogliopathies. The mechanisms underlying the condition and the factors that trigger MSA onset are yet to be established. Environmental and dietary influences have been cited [4] however definitive cause and risk factors are yet to be established. Symptoms of MSA are a manifestation of various pathologies originating in the striatonigral, olivopontocerebellar and central autonomic degeneration. Patients diagnosed with MSA will eventually present with an overlap of symptoms, as illustrated in Figure 1

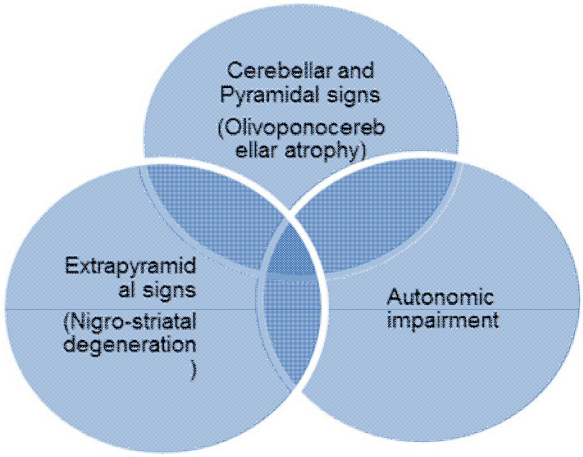


Figure 1 - MSA signs and symptoms (*Adapted from Swan* [5])

Clinical diagnosis of MSA

The term MSA was first used in 1969 - prior to this it had previously been known as Shy -Drager Syndrome. The first diagnostic criteria for MSA were proposed in 1989 [6] and Second Consensus Criteria were defined in 2008 [7] which define three levels of certainty of the diagnosisð possible, probable and definite MSA.

Distinguishing MSA from idiopathic Parkinsonôs disease is still problematic, with both presenting with abnormal DAT scans. Physiotherapists need to be aware of clinical features that characteristically distinguish symptoms of MSA from other Parkinsonism syndromes including PD, although these can be hard to discern in the early stages (see Table 1).

The key distinguishing clinical signs at diagnosis are [3]:

1. Autonomic failure which includes orthostatic hypotension and bladder dysfunction (with erectile dysfunction in men)
2. Poor response to levodopa (may receive transient benefit)
3. Akinetic rigid parkinsonism (present in 58% of cases) or cerebellar ataxia (29%)

Multiple System Atrophy (MSA)	Parkinson's disease (PD)
Rare under 30 years	**Lewy Body pathology**
α-synuclein pathology	α-synuclein pathology
Glial cytoplasmic inclusions (post-mortem)	Bradykinesia
Widespread areas affected – cerebellum, brainstem, basal ganglia	Rigidity
Respiratory symptoms (Stridor/snoring/apnoea, respiratory insufficiency)	Tremor
Dystonia including antecollis	Impaired postural control
Bilateral involvement (early)	**Micrographia**
Autonomic failure (orthostatic hypotension – supine hypertension/constipation)	**Hypophonia**
Sustained gaze evoked nystagmus	**Festinating gait**
Freezing of gait and **early falls (usually backwards)**	Impaired postural control
Cerebellar ataxia	**Dual task interference**
Contractures	Dystonia as a late complication of L-Dopa
Profound fatigue	Constipation
Emotional lability	Cognitive impairment
Minimal response to dopamine (if any)	**Unilateral early symptoms**
	Good response to L-Dopa
	Resting tremor
	Falls (uncommon in early disease)

Progressive Supranuclear Palsy (PSP)	Cortico-Basal Degeneration (CBD)
Cell loss in mid-brain and brain stem	Cell loss in frontoparietal cortex and basal ganglia
Neuro fibrillary tangles of tau proteins	Rare in under 50's
Early postural instability	**Absent autonomic involvement**
Levodopa resistant	Limited response to L-Dopa
Intention tremor	Bradykinesia
Backward falls	Unilateral myoclonus
Vertical gaze palsy	**Early speech apraxia**
Most common in 60+	**Aphasia**
Dysarthria and dysphagia	**Focal asymmetrical limb apraxia**
Bilateral involvement	**Muscle strength not affected in the early phases**
Fatigue	
Emotional lability	
Some autonomic involvement	
Cognitive impairment (greater attentional deficits)	

Table 1: Common and distinguishing features for PD, MSA, PSP and CBD (*Courtesy of Katie Rigg, MSA Nurse Specialist, Northeast UK)*

MSA phenotypes

The criteria used most often to classify MSA recognise two main phenotypes [3]. In general, patients present with predominance of Parkinsonian features (MSA-P) or predominance of cerebellar features (MSA-C), however symptoms overlap. Almost all patients with MSA develop autonomic symptoms preceded by motor symptoms. In Western hemisphere cohorts approximately 80% of cases are predominantly MSA-P. The contrary is true for Eastern hemisphere populations. This may be due to be to racial genetic differences and cultural characteristics. MSA is a rapidly progressing, multi-organ disorder leading to severe synucleopathy. It has been established that the prognosis is poorer in patients who present with early autonomic dysfunction. Patients who have been classified as MSA-P are more likely to have greater functional decline [8].

MSA-P

The motor symptoms characteristic of MSA-P are similar to those observed in typical Parkinson's disease and include rigidity, bradykinesia, tremor and poor balance. However, autonomic symptoms can also predate motor symptoms in MSA-P.

MSA-C

Cerebellar symptoms in MSA originate from the trunk spreading to the lower limbs which eventually affect gait. Gait ataxia, limb kinetic ataxia and scanning dysarthria as well as cerebellar occulomotor disturbances are typical motor symptoms of this phenotype.

Treatment strategies

There is currently no consensus on the stages of disease progression in MSA, nor is it clearly defined. Average survival is close to a decade [8], although this is a guide only. Treatment varies for each stage of the disease and physiotherapists are urged to use their clinical reasoning skills based on the knowledge of the neuropathology of the disease. Patient centred goals should be realistic and appropriate, and multi-disciplinary intervention is key to the provision of a quality service. Medical management is based on symptom alleviation, most notably bradykinesia and orthostatic hypotension [9]. The table below summarises key medical interventions.

Symptom	Intervention
Parkinsonism	L-Dopa (40-60% of MSA patients will initially respond)
Ataxia	None

Orthostatic hypotension	Non-pharmacological, TEDS, fluids, small meals
Neurogenic urinary tract dysfunction	Catheterisation and Ŭ-adregenic antagonists
Constipation	Advice on exercise, fluids and laxatives
Erectile dysfunction	Papaverine and Prostaglandin E1
Breathing problems	CPAP, tracheostomy
Dystonia/pain	Botox, L-Dopa
Camptocormia	None
REM Sleep disorder	Clonazepine
Depression	Pyschotherapy
Cognitive impairment BP management	Anti-cholinesterases Fludrocotison etc

Table 2: Key symptoms and medical management Adapted from: *Flabeau et al* [9]

Physiotherapy

Evidence for the effectiveness of physiotherapy in MSA is restricted to an inter-disciplinary, inpatient intervention for a mixed diagnostic cohort [10], and a case-control study [11]. One UK study reported a positive effect of occupational therapy in MSA [12]. However, there is a significant body of research for physiotherapy for Parkinsonôs disease which can be applied to MSA-P (see below). Physiotherapy evidence for MSA-C (and other degenerative ataxias) is limited, and there are no guidelines.

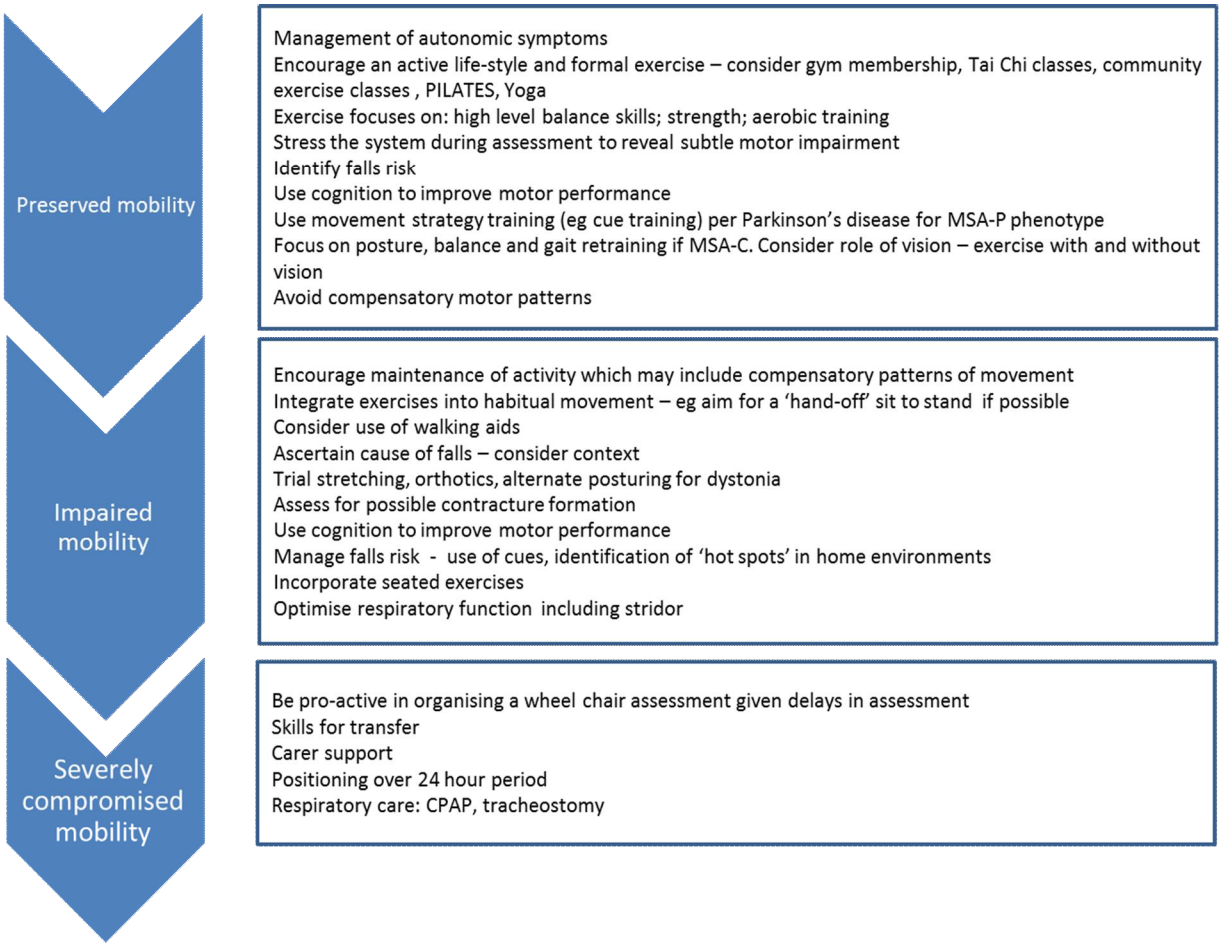
It is important to remember that MSA is progressive and maintenance (let alone improvement) is not always an indicator of effective intervention. Therapy must be integrated into daily living, and realistic programmes developed. Symptoms can vary on a daily basis and it is important to optimise exercise and activity during better days. Long, drawn out sessions of therapy input are unlikely to be successful [13]. A multidisciplinary approach is essential to MSA, and close liaison with the team is critical. Anticipatory planning is essential and integration of other team membersô input (e.g. speech and language therapy, wheelchair services, palliative care). Deterioration can be rapid especially as disease severity increases.
Fig. 2 broadly describes goals of physiotherapy over the time course of the disease.

We first describe physiotherapy intervention common to both phenotypes across a continuum of mobility, which may or may not correspond with time since onset. MSA symptoms may well be established at time of diagnosis, in which case at least some features of mobility will be impaired. *Ideally, physiotherapy will begin prior to the presence of motor disturbance, and as soon as possible after diagnosis.* MSA is a rapidly progressive and aggressive disorder; planning and team effort is of paramount importance in management. The presence of orthostatic hypotension coupled with fatigue can make physiotherapy intervention challenging. However, fatigue should not stop patients from undertaking and benefiting from exercise. Graduated programmes of activity can improve levels of fatigue over time, but a balance must be achieved.

Physiotherapists also need to be aware of the importance of minimising the impact of the autonomic dysfunction on physical function. The following advice may be useful:

- If necessary, elevate the head of the bed (30°) during sleep ï ideally use a mattress variator to achieve this
- Use TED stockings
- Ensure postural transitions are slow and controlled, especially on sit to stand when there is the greatest risk of a fall in blood pressure levels
- Avoid prolonged standing and/or activities that require prolonged stand
- Increase fluid intake especially before exercise
- Swimming or any exercise in a pool may be particularly beneficial because of the counteractive effect of hydrostatic pressure on postural hypotension
- Be aware of the effect of warm environments and activities that may elicit the Valsalva manoeuvre (forcible exhalation whilst keeping nose and mouth closed)
- Stimulate BP regulation by, e.g. calf pump exercises prior to movement, crossing arms and legs, encouraging flexed postures
- Avoid exercise in the early morning and ensure exercise is not carried out in a room that is too hot

Figure 2: A framework for physiotherapy over the course of MSA



Preserved mobility

It will be important to establish a relationship with the person with MSA and their family who may also wish to encourage and be involved in physical activity and physiotherapy. Gently assist with coming to terms with diagnosis, if appropriate.

General advice may be all that is required if motor control is essentially preserved. Formal exercise should be encouraged (group classes, daily routines, gym attendance), but for people who have never been interested in this kind of exercise, a broader definition is required. It will be more useful to talk about maintenance of áactivityô (gardening, walking the dog, walking to the shops) rather than éexerciseô

Detailed assessment will reveal any early, subtle changes in performance, e.g. use of a broader base of support to maintain postural control and gait, inability to respond to unexpected

perturbations, abnormal synergistic patterns of movement. In such cases, physiotherapy needs to be selective and appropriate to ameliorate motor impairment. Focus on postural control and identify triggers for falls. The strongest predictor of future falls is a previous fall, by which time associated risk factors such as fear of falling may also be evident. Physiotherapists need to identify falls risk earlier than this, and pre-empt the initial fall. This is challenging, but comprehensive assessment of postural control and falls risk during this stage is critical. Stress the system in clinic (or home) by testing gait under dual task conditions (gait plus concurrent cognitive task) and increase environmental difficulty (over obstacles, through narrow walkways etc.). Examine postural control strategies using assessment tools that reveal underlying deficit (e.g. the BESTest) [14], rather than relying solely on functional tasks. Use attentional strategies to compensate for motor deficit and produce effective movement. This is especially critical if PD signs predominate. Use of outcome measures may be relevant (e.g. the Unified MSA Rating Scale (UMSARS) or timed walks) if monitoring change is important.

Respiratory symptoms such as sleep apnoea, dysrhythmia and stridor can manifest early on [9] and specific assessment warranted. Check breathing techniques and if appropriate, link techniques to exercise and activity at this stage.

Impaired mobility

As motor and autonomic symptoms progress, selective input is required to optimise performance. General advice regarding exercise and/or activity may be less relevant. Focal dystonia may be evident and require symptomatic relief such as botulinum toxin therapy. Physiotherapy for focal dystonia may be worth considering (e.g. gentle stretching, support, sensory input), although there is no quality evidence to support efficacy. When assessing gait and functional mobility identify compensatory movements and how effective they are. Onset of falls is likely. Identify cause of falls and future risk via a structured assessment, taking into consideration the context of the fall as well as frequency. Identify ôhot spotsôin the home and consider compensatory strategies such as visual cues, carer-prompts. Again, test dual task gait and increase task difficulty. Consider walking aids as mobility impairment increases.

Immobility

The role of the physiotherapist for people with more advanced symptoms is centred on the provision of palliative care and ensuring maximal independence [15]. It is critical to optimise quality of life regardless of life expectancy. Vital to successful physiotherapy at this stage is input from multi-disciplinary team members who are co-ordinating this phase of care. Expertise regards positioning, equipment provision, maintenance of airways, and passive movements/ massage will be required. Focus on functional mobility including bed mobility and transfers/mobility during the night. Maintenance of airways will become a priority. Teach active cycle of breathing techniques, assisted cough, modified postural draining if appropriate, as well as relaxation techniques, with support of a carer. Input is likely to be in a personôs home and centred around the comfort of the individual and needs of them and their families. Liaise with the palliative care team and respiratory home ventilation team as required.

Physiotherapy intervention for MSA-P

As noted above, although signs and symptoms overlap, MSA is characterised by distinct phenotypes. Evidence for MSA-P is inferred from movement science research for PD. Physiotherapists are encouraged to read the paper by Rochester and colleagues which outlines a

strategy for intervention [16], and to familiarise themselves with PD physiotherapy guidelines [17]. Use of cognitive strategies is encouraged from early on, and can be a powerful adjunct to intervention [18]. Identify strategies for safe ambulation, such as stepping in confined spaces, turning, and negotiating doorways. Be aware of visuo-spatial deficit which may impact on perception of body in space and relation of body to external objects. People with MSA-P are also likely to experience freezing and festination, for which cues are effective [18] and best taught early on.

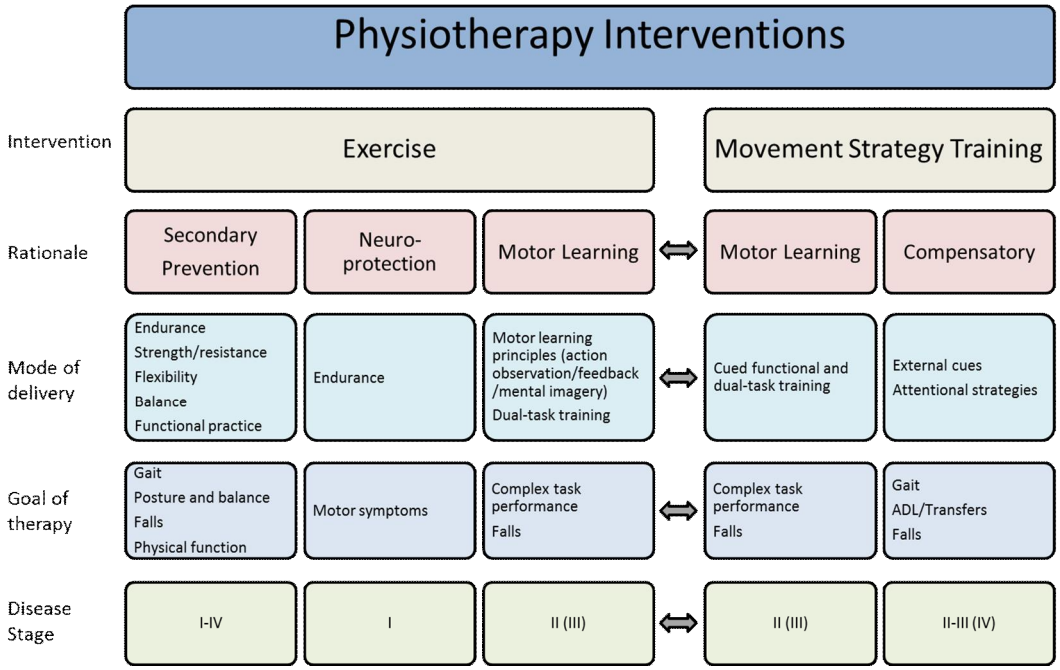


Fig. 3 describes a clinical framework for physiotherapy in PD which is relevant to MSA-P, and describes intervention for different stages of PD (adapted from: *L Rochester et al* [16])

As noted by Flabeau [9], physiotherapy remains the best therapeutic option for cerebellar ataxia in MSA. There are no guidelines as such for intervention for MSA-C or for degenerative ataxias in general with current evidence reported as ôLevel IIô[19]. A recent systematic review indicated that effective rehabilitation should be home-based and intensive, and it should start in earlier stages of disease, given the potential for early rather than late gains. Studies concerning degenerative cerebellar ataxias indicate benefits from early, intensive, high-frequency training programme

followed by maintenance therapy [20]. Preservation of balance and strength (core strength and large muscle groups) is indicated, especially in the early stages.

Outcome measures

Use of outcome measures may be appropriate, but given the deteriorating nature of MSA you may prefer to be guided by the presence and intensity of current symptoms, via self report. Along with the usual physiotherapy outcomes (timed walk, functional mobility scales, balance and falls self-efficacy etc.), you may wish to use a disease-specific scale such as the Unified MSA Rating Scale (UMSARS) [21]. The UMSARS is a 4 domain scale that includes impairment and functional tasks, motor ability, autonomic function and global disability. Responsiveness has been examined [21,22] and decline in UMSARS scores over 2 years reported. It appears to be more responsive that MSA-specific, health quality of life scales [23].

Key points

- MSA presents as a heterogeneous disorder with often a mix of symptoms.
- Treat early and maintain therapy input over the course of the disease.
- Maintain strength and physiologic fitness within limits of autonomic dysregulation.

For more information about MSA or to contact our specialist nurses please see our website: www.msatrust.org.uk or e-mail support@msatrust.org.uk

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Further reading

1. The Multiple System Atrophy Trust website http://www.msatrust.org.uk/
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