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The European Multiple System Atrophy-Study Group (EMSA-SG)

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Summary. *Introduction*. The European Multiple System Atrophy-Study Group (EMSA-SG) is an academic network comprising 23 centers across Europe and Israel that has constituted itself already in January 1999. This international forum of established experts under the guidance of the University Hospital of Innsbruck as coordinating center is supported by the 5th framework program of the European Union since March 2001 (QLK6-CT-2000-00661). *Objectives*. Primary goals of the network include (1) a central Registry for European multiple system atrophy (MSA) patients, (2) a decentralized DNA Bank, (3) the development and validation of the novel Unified MSA Rating Scale (UMSARS), (4) the conduction of a Natural History Study (NHS), and (5) the planning or implementation of interventional therapeutic trials. *Methods*. The EMSA-SG Registry is a computerized data bank localized at the coordinating centre in Innsbruck collecting diagnostic and therapeutic data of MSA patients. Blood samples of patients and controls are recruited into the DNA Bank. The UMSARS is a novel specific rating instrument that has been developed and validated by the EMSA-SG. The NHS comprises assessments of basic anthropometric data as well as a range of scales including the UMSARS, Unified Parkinson's Disease Rating Scale (UPDRS), measures of global disability, Red Flag list, MMSE (Mini Mental State Examination), quality of live measures, i.e. EuroQoL 5D (EQ-5D) and Medical Outcome Study Short Form (SF-36) as well as the Beck Depression Inventory (BDI). In a subgroup of patients dysautonomic features are recorded in detail using the Queen Square Cardiovascular Autonomic Function Test Battery, the Composite Autonomic Symptom Scale (COMPASS) and measurements of residual urinary volume. Most of these measures are repeated at 6-monthly follow up visits for a total study period of 24 months. Surrogate markers of the disease progression are identified by the EMSA-SG using magnetic resonance and diffusion weighted imaging (MRI and DWI, respectively). *Results*. 412 patients have been recruited into the Registry so far. Probable MSA-P was the most common diagnosis (49% of cases). 507 patients donated DNA for research. 131 patients have been recruited into the NHS. There was a rapid deterioration of the motor disorder (in particular akinesia) by 26.1% of the UMSARS II, and – to a lesser degree – of activities of daily living by 16.8% of the UMSARS I in relation to the respective baseline scores. Motor progression was associated with low motor or global disability as well as low akinesia or cerebellar subscores at baseline. Mental function did not deteriorate during this short follow up period. *Conclusion*. For the first time, prospective data concerning disease progression are available. Such data about the natural history and prognosis of MSA as well as surrogate markers of disease process allow planning and implementation of

multi-centre phase II/III neuroprotective intervention trials within the next years more effectively. Indeed, a trial on growth hormone in MSA has just been completed, and another on minocycline will be completed by the end of this year.

Keywords: Multiple system atrophy, European Multiple System Atrophy-Study Group, Registry, DNA Bank, Unified MSA Rating Scale, Natural History Study, therapeutic trials.

History, organisation, and key goals

Recognizing a growing need for therapeutic intervention in multiple system atrophy (MSA), an academic network called European MSA-Study Group (EMSA-SG) was formed in 1999 by 20 research groups in eleven countries (Germany, Austria, France, United Kingdom, Portugal, Spain, Italy, Sweden, Denmark, Slovenia and Israel) (Wenning et al., 2004a). The first meeting was hold in January, 1999, in Innsbruck, Austria. In March 2001, the EMSA-SG received support for a three-year project within the 5th European Union Framework Program for Research, Technological Development and Demonstration (QLK6-CT-2000-00661). An one year extension of the project funded by savings from the first year was approved by the European Union, so the funded study period continued until end of February 2005. The Start-Up Meeting was held in Henley, United Kingdom, in May 2001. The subsequent Annual General Meetings took place in Innsbruck (May 2002), Barcelona, Spain (July 2003), and in Innsbruck (December 2004). During the second year of the funded period, 3 affiliate centres joined the EMSA-SG eventually comprising 23 sites across Europe and Israel. This concerted action representing a consortium of scientific investigators from academic and research centres is co-ordinated by W. Poewe and G. K. Wenning. The whole project EMSA-SG aims (1) to establish a European MSA Registry (EMSA-SG Registry), (2) to establish a decentralized DNA Bank, (3) to develop and validate the novel disease specific Unified MSA Rating Scale (UMSARS) using a multicentre cross-sectional as well as prospective study approach, (4) to conduct a multicentre prospective Natural History Study (NHS) including various sub-protocols, and partly as the result of these efforts (5) to plan and implement therapeutical interventional trials. The EMSA-SG has established close ties with the Northern American MSA-Study Group (NAMSA-SG) chaired by C. Shults, San Diego, CA, USA, whose work program also includes a NHS. A homepage of the EMSA-SG has been set up for all those who wish to contact the study group (www.emsa-sg.org/).

EMSA-SG Registry

A main objective of the EMSA-SG is to establish a MSA patient registry, a central MSA database (Geser et al., 2004f; Stampfer-Kountchev et al., 2005). The key component of the EMSA-SG Registry, i.e. a case report form called ''Minimal Data Set'' (MDS) that has been developed by the co-ordinating centre Innsbruck, was proposed and eventually defined at the start-up Meeting in Henley. The MDS comprises basic anthropometric data, salient clinical features as well as the diagnostic work up and therapeutic management of the disease. It is

based on published clinical diagnostic criteria according to Gilman et al. (1998) or Quinn et al. (1994) in order to achieve a questionnaire that contains all relevant diagnostic information. In addition, almost all conceivable therapeutical options for MSA patients were included. Annual MDS follow-up forms generate important data on evolution of basic clinical features, the maintenance or change of clinical diagnosis as well as vital status or post-mortem validation.

From the beginning of the project until December 2004, 412 European MSA-patients at 19 EMSA-SG sites were entered into the Registry. 3% of the patients (''grey cases'') did not formally fulfil the published criteria for MSA acc. to Gilman (1998) at the time of enrolment. 20% of cases were categorized as possible MSA, and 77% as probable MSA. 63% were diagnosed as MSA-P, and 34% as MSA-C. Taken together, probable MSA-P was the single most common diagnosis (49% of cases) in this large pool of European MSA patients. Main clinical features included: orthostatic hypotension (71%), bladder disturbances including urinary incontinence (77%) and incomplete bladder emptying (60%), erectile failure (90% of men), bradykinesia (91%), rigidity (86%), postural instability (84%), postural tremor (52%), rest tremor (36%), sustained nystagmus (28%), limb ataxia (56%), gait ataxia (64%), and pyramidal signs (61%). The overall pattern of clinical features was similar in all contributing EMSA-SG sites. The vast majority of patients were subjected to MR imaging (83%) and 50% of patients to cardiovascular autonomic function tests. The majority of cases (71%) received L-Dopa. A beneficial response to L-Dopa was present in 59% of the treated patients only. The EMSA-SG Registry will be helpful for refining current diagnostic and therapeutic standards.

EMSA-SG DNA Bank

During the course of the NHS EMSA-SG is coordinating decentralized DNA storage and processing in the participating centers according to standard protocols led by T. Gasser, Tuebingen, Germany, in order to facilitate research into ecogenetics of MSA. DNA samples from 507 MSA patients have been collected. Three projects have been performed so far: (1) Genotyping of a functional polymorphism in the dopamine beta-hydroxylase (DBH) gene revealed no association between the DBH-1021 C$\rightarrow$T polymorphism and MSA (Healy et al., 2004); (2) Screening for fragile site mental retardation 1 gene repeat expansions demonstrated that the fragile X tremor ataxia syndrome is only a rare cause of atypical parkinsonism including MSA, as only 2 premutation carriers among 79 female patients and no premutation carriers among 86 male patients were found (Kamm et al., 2004); (3) α-synuclein haplotyping showed no association between the α-synuclein gene and MSA (Ozawa et al., in preparation). Novel genetic studies in MSA are currently on the way.

Unified MSA Rating Scale (UMSARS)

In 2001, the EMSA-SG developed and validated the UMSARS including a teaching tape (Wenning et al., 2004b; Stampfer-Kountchev et al., 2003), since previous studies on MSA showed that cerebellar signs can compromise accurate assessment of parkinsonism by the Unified Parkinson's Disease Rating Scale

(UPDRS) and, conversely, parkinsonism can obscure the evaluation of cerebellar features during assessments with the International Cooperative Ataxia Rating Scale (ICARS) (Tison et al., 2002a, b). The novel UMSARS was designed comprising 4 parts, including a historical review of disease related impairments (I, 12 items), detailed motor examination (II, 14 items), autonomic examination (III) assessing orthostatic hypotension (blood pressure is measured in supine position and again on standing) or symptoms, and a global disability scale (IV). A single score using a 0 (no impairment) to 4 (severe impairment) scale was generated for each item. The maximum scores are 48 points for UMSARS I and 56 points for UMSARS II. In contrast to the UPDRS III, for a given item of the UMSARS II that involved limb assessment, only the worst limb is rated. Based on the validation study, the UMSARS represents the first multidimensional, reliable and valid scale to semiquantitatively assess disease severity in MSA patients. Therefore, the UMSARS will be of major importance in future natural history studies or therapeutic intervention trials concerning MSA patients.

EMSA-SG NHS

With the central EMSA-SG Registry in place as well as UMSARS validation completed, the EMSA-SG was able to launch the multicentre NHS, whose goals include the prospective assessment of (1) UMSARS rates of disease progression including prognostic predictors (Geser et al., 2004e, 2005), (2) warning signs (''red flags'') (Geser et al., 2004c, g, 2005b) and (3) health related quality of MSA (Sawires et al., 2004; Stampfer-Kountchev, 2004; Geser et al., 2004a, b, d; Wenning et al., 2005a, b). A cohort of 131 European MSA patients was enrolled in the NHS. Patient assessments comprise basic anthropometric and clinical data as well as a range of scales including the UMSARS, UPDRS, a 3 point global severity scale (SS3), Red Flag list, Mini-Mental-State Examination, quality of live measures i.e. EuroQoL 5D and Medical Outcome Study Short Form (SF-36), as well as the Beck Depression Inventory. The flow charts of the NHS including the administered scales are shown in Fig. 1 and Table 1. In a subgroup of patients dysautonomic features are recorded in detail using the

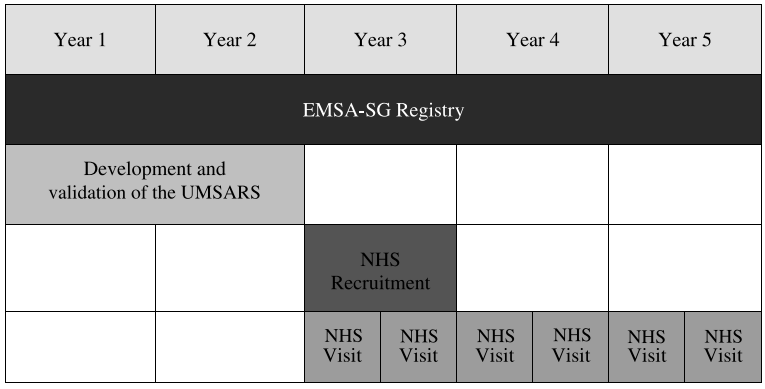

Fig. 1. Flowchart I of the EMSA-SG NHS. *EMSA-SG* European Multiple System Atrophy-Study Group, *UMSARS* Unified Multiple System Atrophy Rating Scale, *NHS* Natural History Study

Table 1. Flowchart II of the EMSA-SG NHS

Evaluation criteria		Baseline	Follow up			
		M 0	M 6	M 12	M 18	M 24
MDS	Clinical diagnosis	+				
	Concomitant medication	+				
	Neurological examination/ disease characteristics	+				
	Routine investigations	+				
MDS follow-up	Vital status		+	+	+	+
	Review of clinical diagnosis		+	+	+	+
	Concomitant medication update		+	+	+	+
	Neurological examination/ disease characteristics		+	+	+	+
	Routine investigations update		+	+	+	+
Rating scales	Red flag list	+	+	+	+	+
	MMSE	+	+	+	+	+
	UMSARS	+	+	+	+	+
	UPDRS I-IV (optional)	+	+	+	+	+
	SS3	+	+	+	+	+
	H&Y	+	+	+	+	+
	S&E ADL	+	+	+	+	+
	EQ-5D	+	+	+	+	+
	SF-36 (optional)	+	+	+	+	+
	BDI (optional)	+	+	+	+	+
	COMPASS (optional)	+				
	COMPASS CSS (optional)		+	+	+	+

EMSA-SG NHS European Multiple System Atrophy-Study Group Natural History Study, *MDS* Minimal Data Set, *M* Month, *MMSE* Mini Mental State Examination, *UMSARS* Unified Multiple System Atrophy Rating Scale, *UPDRS I–IV* Unified Parkinson's Disease Rating Scale I–IV, *SS3* Severity Scale 3, *H&Y* Hoehn and Yahr Staging Scale, *S&E ADL* Schwab and England Activities of Daily Living Scale, *EQ-5D* EuroQoL-5D, *SF-36* Medical Outcome Study Short Form, *BDI* Beck Depression Inventory, *COMPASS* Composite Autonomic Symptom Scale, *COMPASS CSS* Composite Autonomic Symptom Scale Change Scoring Scale

Queen Square Cardiovascular Autonomic Function Test Battery, the Composite Autonomic Symptom Scale or Composite Autonomic Symptom Scale Change Scoring Scale as well as serial measurements of residual urinary volume. Most of these measures are repeated at 6-monthly follow up visits for a total study period of 24 months. Surrogate markers of the disease process (progression indices) are identified by the EMSA-SG using both magnetic resonance and diffusion weighted imaging (MRI and DWI, respectively) and are correlated with the clinical data.

Analysis of progression in 76 patients showed a significant rapid deterioration of the motor disorder, in particular akinesia, and – to a lesser degree – of activities of daily living in MSA using the disease specific UMSARS within 6.4 months (Geser et al., 2005). In fact, the mean difference of the UMSARS I between baseline and follow-up was 4.2 points, corresponding to a 16.8% increase in relation to the baseline UMSARS I scores (Fig. 2). Further, the mean

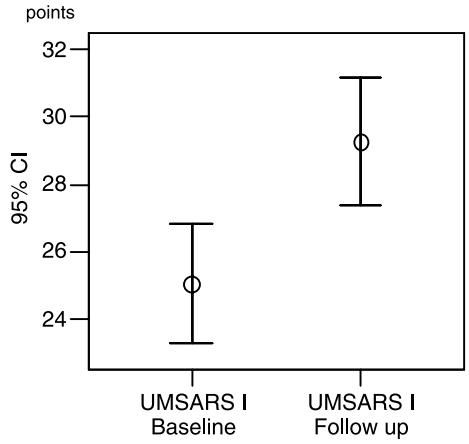

Fig. 2. Error bars showing total Unified Multiple System Atrophy Rating Scale I (UMSARS I) scores both at baseline and follow up visit. $p < 0.0001$

difference of the UMSARS II was 6.6 points, consistent with a 26.1% increase in relation to the baseline UMSARS II scores (Fig. 3). Moreover, the mean difference of the UMSARS IV was 0.4 points, corresponding to a 12.5% increase in relation to the baseline UMSARS IV scores (Fig. 4). Motor progression was associated with low motor or global disability as well as low akinesia or cerebellar subscores at baseline. Mental function does not seem to deteriorate during this short follow up period.

Therapeutic trials

Two European research initiatives – EMSA-SG and Neuroprotection and Natural History in Parkinson Plus Syndromes (NNIPPS) – are presently conducting multicentre intervention trials in MSA using candidate neuroprotective agents. Indeed, a trial on growth hormone in MSA has just been completed by

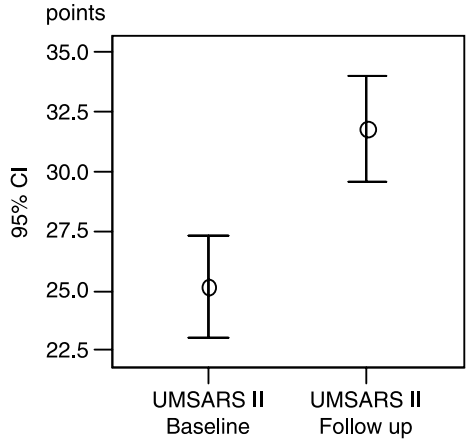

Fig. 3. Error bars showing total Unified Multiple System Atrophy Rating Scale II (UMSARS II) scores both at baseline and follow up visit. $p < 0.0001$

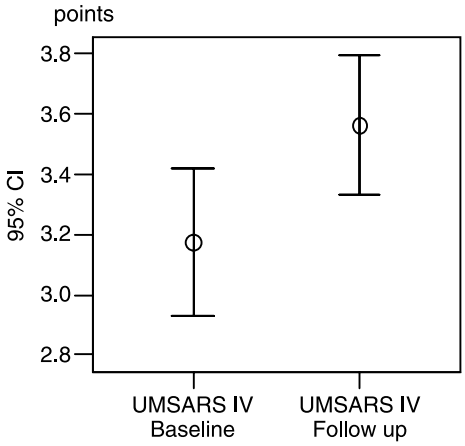

Fig. 4. Error bars showing Unified Multiple System Atrophy Rating Scale IV (UMSARS IV) stages both at baseline and follow up visit. $p < 0.0001$

EMSA-SG, and another EMSA-SG trial on minocycline will be completed by end of this year.

Conclusion

During the last 15 years there have been major advances in our understanding of the cellular pathology of MSA. The EMSA-SG DNA Bank facilitates further ecogenetic studies in MSA in order to identify genetic risk factors for MSA. At the same time the first multicentre intervention trials have been launched in Europe. For the first time, prospective data concerning disease progression are available. Such data about the natural history and prognosis of the MSA as well as surrogate markers of the disease process allows planning and implementation of future multi-centre phase II/III neuroprotective intervention trials within the next years more effectively. Although therapeutic options are limited at present, there is a real hope for a radical change of our approach to this devastating illness, as – even if the ongoing trials are negative – they will certainly stimulate further trial activity in MSA that is desperately needed to tame this "beast".

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References

Geser F, Ndayisaba JP, Frick C, Stampfer-Kountchev M, Högl B, Wenning GK, Poewe W (2004a) Sleep and nocturnal disability in multiple system atrophy as measured by the Parkinson's disease sleep scale. Mental Dysfunction in Parkinson's Disease, Salzburg, October 24–27, 2004 (A42)

Geser F, Ndayisaba JP, Stampfer-Kountchev M, Kemmler G, Wenning GK, Poewe W (2004b) Cognitive dysfunction in multiple system atrophy (MSA): a preliminary cross-sectional analysis of 98 European MSA patients. Mental Dysfunction in Parkinson's Disease, Salzburg, October 24–27, 2004 (A42)

Geser F, Stampfer-Kountchev M, Seppi K, Ndayisaba JP, Frick C, Poewe W, Wenning GK and the EMSA-SG (2004c) Warning signs ('red flags') in possible MSA: a preliminary cross-sectional analysis of the European MSA-Study Group (EMSA-SG). Funct Neurol 19(2): 144

Geser F, Stampfer-Kountchev M, Seppi K, Ndayisaba JP, Poewe W, Wenning GK, on behalf of the European MSA-Study Group (EMSA-SG) (2004d) Depression in multiple system atrophy (MSA) – a preliminary cross-sectional analysis of 95 European MSA patients. Funct Neurol 19(2): 143

Geser F, Stampfer-Kountchev M, Seppi K, Ndayisaba JP, Poewe W, Wenning GK, on behalf of the European MSA-Study Group (EMSA-SG) (2004e) The European MSA-Study Group (EMSA-SG) Natural History Study of Multiple System Atrophy (MSA): an analysis of baseline data. Mov Disord 19 (Suppl 9): 347

Geser F, Stampfer-Kountchev M, Seppi K, Ndayisaba JP, Wenning GK, Poewe W, on behalf of the European MSA-Study Group (EMSA-SG) (2004f) The clinical presentation of multiple system atrophy (MSA) in Europe: an interim analysis of the EMSA-SG (European MSA-Study Group) Registry. Mov Disord 19 (Suppl 9): 347

Geser F, Stampfer-Kountchev M, Seppi K, Ndayisaba JP, Wenning GK, Poewe W, on behalf of the European MSA-Study Group (EMSA-SG) (2004g) Warning signs ('Red flags') in multiple system atrophy (MSA): a preliminary cross-sectional analysis of 79 European MSA-P patients. Mov Disord 19 (Suppl 9): 346

Geser F, Ndayisaba JP, Stampfer-Kountchev M, Seppi K, Poewe W, Wenning GK, on behalf of EMSA-SG (2005) Motor progression of multiple system atrophy (MSA): a prospective study using the Unified MSA Rating Scale (UMSARS). Mov Disord 20 (Suppl 10): 105

Geser F, Stampfer-Kountchev M, Colosimo C, Tison F, Tolosa E, Quinn N, Poewe W, Wenning GK (2005b) Criteria for motor 'red flags' in MSA: a proposal. Mov Disord (in press)

Gilman S, Low P, Quinn N, Albanese A, Ben-Shlomo Y, Fowler C, Kaufmann H, Klockgether T, Lang A, Lantos P, Litvan I, Mathias C, Oliver E, Robertson D, Schatz I, Wenning G (1998) Consensus statement on the diagnosis of multiple system atrophy. American Autonomic Society and American Academy of Neurology. Clin Auton Res 8(6): 359–362

Healy DG, Abou-Sleiman PM, Ozawa T, Lees AJ, Bhatia K, Ahmadi KR, Wullner U, Berciano J, Moller JC, Kamm C, Burk K, Barone P, Tolosa E, Quinn N, Goldstein DB, Wood NW (2004) A functional polymorphism regulating dopamine beta-hydroxylase influences against Parkinson's disease. Ann Neurol 55(3): 443–446

Kamm C, Buerk K, Illig T, Wichmann E, the European Multiple System Atrophy (EMSA) Study Group, Gasser T (2004) Screening of a large cohort of patients with atypical parkinsonism for repeat expansions in the *FMR1* gene. Mov Disord 19 (Suppl 9): 352

Ozawa T, Healy DG, Abou-Sleiman PM, Ahmadi KR, Quinn N, Lees AJ, Shaw K, Wullner U, Berciano J, Moller C, Kamm C, Burk K, Josephs KA, Barone P, Tolosa E, Goldstein DB, Holton JL, Gasser T, Revesz T, Wood NW and the European MSA-Study Group (2005) The alpha synuclein gene in multiple system atrophy (in preparation)

Quinn N (1994) Multiple system atrophy. In: Marsden CD, Fahn S (eds) Movement disorders 3. Butterworth-Heinemann, London, pp 262–281

Sawires M, Geser F, Seppi K, Kemmler G, Poewe W, Wenning GK, on behalf of the European-MSA Study Group (EMSA-SG) (2004) Health-related quality of life in MSA measured by the Short Form 36 Health survey questionnaire (SF-36) in European MSA patients: a cross-sectional baseline analysis of the EMSA-SG-Natural History Study. Mov Disord 19 (Suppl 9): 341

Stampfer-Kountchev M, Seppi K, Geser F, Mathias C, Poewe W, Wenning GK (2003) Validation of item I-9 (orthostatic hypotension) of the Unified MSA Rating Scale (UMSARS) using screening cardiovascular autonomic function tests: a pilot study by EMSA-SG. Clin Auton Res 13(2): 140

Stampfer-Kountchev M, Köllensperger M, Geser F, Poewe W, Wenning GK, on behalf of the European-MSA Study Group (EMSA-SG) (2004) Impact of dysautonomia versus motor impairment on quality of life in MSA: a cross-sectional baseline analysis of the EMSA-SG Natural History Study. Funct Neurol 19(2): 148

Stampfer-Kountchev M, Geser F, Seppi K, Poewe W, Wenning GK, and the European MSA-Study Group (EMSA-SG) (2005) The European MSA Registry (EMSA-R): an update. Mov Disord (in press)

Tison F, Yekhlef F, Balestre E, Chrysostome V, Quinn N, Wenning GK, Poewe W (2002a) Application of the International Cooperative Ataxia Scale rating in multiple system atrophy. Mov Disord 17: 1248–1254

Tison F, Yekhlef F, Chrysostome V, Balestre E, Quinn NP, Poewe W, Wenning GK (2002b) Parkinsonism in multiple system atrophy: natural history, severity (UPDRS-III), and disability assessment compared with Parkinson's disease. Mov Disord 17: 701–709

Wenning G, Geser F, Seppi K, Stampfer-Kountchev M, Poewe W, and the European Multiple System Atrophy Study Group (EMSA-SG) (2004a) The European MSA-Study Group. Funct Neurol 19(2): 140

Wenning GK, Tison F, Seppi K, Sampaio C, Diem A, Yekhlef F, Ghorayeb I, Ory F, Galitzky M, Scaravilli T, Bozi M, Colosimo C, Gilman S, Shults CW, Quinn NP, Rascol O, Poewe W, and the Multiple System Atrophy Study Group (2004b) Development and validation of the Unified Multiple System Atrophy Rating Scale (UMSARS). Mov Disord 19(12): 1391–1402

Wenning G, Geser F, Ndayisaba JP, Stampfer-Kountchev M, Seppi K, Poewe W, on behalf of EMSA-SG (2005a) Health related Quality of life (Hr-Qol) in multiple system atrophy (MSA). Mov Disord 20 (Suppl 10): 106

Wenning GK, Köllensperger M, Stampfer-Kountchev M, Geser F, Seppi K, Elia A, Albanese A, Gurevich T, Giladi N, Djaldetti R, Fowler C, Low P, Mathias C, Poewe W (2005b) Dysautonomia progression in multiple system atrophy: a prospective study by the European MSA-Study Group. Clin Auton Res 15: 159

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