



EFAS SCHOOL & MEETING 2017

INNSBRUCK
16th - 17th FEBRUARY
2017

PROGRAM





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CONGRESS INFORMATION

VENUE MZA

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EFAS 2017 SCIENTIFIC PROGRAM

Thursday, 16th February 2017 EFAS School

08.30-08.40 **Welcome**
G. K. Wenning, Innsbruck and W. Struhal, Linz

08.40-09.00 **A Physiologist`s view on ANS function**
I. Rocha, Lisbon

09.00-09.20 **A Neurologist`s view on ANS function**
H. Lahrman, Vienna

4 ANS Classes (2 groups, 45 minutes/topic,
background/case presentations)

09.30-11.10 **Tilt table testing**
Rotation: 10.15-10.25 *A. Fanciulli, Innsbruck / A. Pavy Le Traon, Toulouse*

09.30-11.10 **Unclassified TLOC: history taking in the emergency room and
in the syncope clinic**
Rotation: 10.15-10.25 *M. Sojer, Innsbruck / J. G. Van Dijk, Leiden*

11.10-11.40 **Coffee break**

11.40-13.20 **Seizure or syncope: role of Video-EEG monitoring**
Rotation: 12.25-12.35 *I. Unterberger, Innsbruck / R. Thijs, Leiden*

11.40-13.20 **Urogenital function testing**
Rotation: 12.25-12.35 *G. Kiss, Innsbruck / D.B. Vodusek, Ljubljana*

13.20-14.00 **Lunch**

14.00-15.40 **Gastrointestinal motility dysfunction**
Rotation: 14.45-14.55 *H. Zoller, Innsbruck / A. Finkenstedt, Innsbruck*

14.00-15.40 **Sleep disorders**
Rotation: 14.45-14.55 *B. Högl, Innsbruck / G. Calandra-Buonaura, Bologna*

15.40-16.00 **Coffee break**

16.00-18.00

Round Table discussion: Controversies in the diagnosis and treatment of supine hypertension

*G. Calandra-Buonaura, Bologna / S. Eschlboeck, Innsbruck /
A. Fanciulli, Innsbruck / M. Hilz, London / J. Jordan, Hannover /
H. Kaufmann, New York / H. Lahrman, Vienna / L. Norcliffe-Kaufmann,
New York / A. Pavy Le Traon, Toulouse / D. Robertson, Nashville /
I. Rocha, Lisbon / W. Struhal, Linz / R. Thijs, Leiden / J. G. Van Dijk, Leiden /
G.K. Wenning, Innsbruck*

on behalf of the EFAS/AAS Joint Taskforce on supine hypertension

(EFAS/AAS Position Statement to be submitted to CAR)

EFAS 2017 SCIENTIFIC PROGRAM

Friday, 17th February 2017

EFAS Meeting

08.30-08.40

Opening ceremony:

W. Struhal, Linz – EFAS President

G. K. Wenning, Innsbruck – Congress President

08.40-11.05

Session I: Primary autonomic failure

Chairs: G.K. Wenning, Innsbruck and G. Ransmayr, Linz

Introduction - G. K. Wenning, H. Kaufmann
Memorial lecture of the Austrian Otto Loewi Society –
The many faces of multiple system atrophy
N. Quinn, London

Biomarkers in α -synucleinopathies: an update
I. Stankovic, Belgrade

Cardiovascular autonomic failure: diagnosis and prognosis
A. Fanciulli, Innsbruck

Cardiovascular autonomic failure: therapeutic advances
H. Kaufmann, New York

Neurogenic bladder in MSA and PD: new insights
H. Madersbacher, Innsbruck

Preclinical MSA testbeds: what is in the pipeline
N. Stefanova, Innsbruck

Interventional MSA trials: why have they failed so far?
F. Krismer, Innsbruck

11.05-11.20

Coffee break

11.20-13.00

Session II: Sleep and epilepsy

Chairs: B. Högl, Innsbruck and G. Calandra-Buonaura, Bologna

RBD in neurodegenerative diseases
F. Provini, Bologna

IGLON 5: REM Parasomnia with autonomic involvement

B. Högl, Innsbruck

Narcolepsy: translational evidence

A. Silvani, Bologna

Ictal asystole: life threatening vagal storm or a benign seizure self-termination?

R. Thijs, Leiden

Sudden death in familial dysautonomia: mechanisms and risk factors

H. Kaufmann, New York

13.00-14.00

Lunch and poster session

14.00-15.00

Session III: Syncope and Postural tachycardia syndrome (PoTS)

Chairs: J. G. Van Dijk, Leiden and G.K. Wenning, Innsbruck

Vasovagal syncope with asystole: to pace or not to pace?

M. Brignole, Lavagna

Psychogenic pseudosyncope: diagnosis and follow-up

J.G. Van Dijk, Leiden

PoTS or PoTSS? Critical reappraisal of the pathophysiology

W. Struhal, Linz

15.00-16.20

Session IV: Genetic autonomic disorders

Chairs: H. Kaufmann, New York and M. T. Pellecchia, Salerno

Hereditary sensory and autonomic neuropathies

L. Norcliffe-Kaufmann, New York

Autonomic dysfunction in LARRK 2 Parkinsonism

B. Tijero, Bilbao

Contursi Parkinson's disease cohort

M. T. Pellecchia, Salerno

Interventional therapies in Fabry's disease

M. Hilz, London

16.20-16.40

Coffee break

16.40-17.40

Session V: Botulinum-Toxin in autonomic disorders

Chairs: S. Bösch, Innsbruck and G.K. Wenning, Innsbruck

Hyperhidrosis

S. Bösch, Innsbruck

Esophageal motility disorders

H. Zoller, Innsbruck

Detrusor hyperreflexia

D. Vodusek, Ljubljana

17.40-18.10

Oral presentations of selected abstracts incl. EFAS Best Poster Award

18.10-18.20

Concluding remarks

18.20-19.00

EFAS Board meeting

NOTES

Site map

EFAS Meeting

MZA - building

Ground floor - Seminar

EFAS School

1 MZA - building

Unclassified TLOC

Seminar room 1 - 1st basement

Lunch and Coffee Break

Ground floor

Gastrointestinal motility dysfunction

Seminar room 1+2 - 1st basement

2 Internal Medicine building

Sleep disorders

North wing - 3rd floor

3 FKK - building

Tilt table testing

Tilt test lab - ground floor

Seizure or syncope

Video - EEG Unit - 7th floor

14 Administration building

Urogenital function testing

Ground floor



ng

room



ABSTRACTS

Basic Science

1. Serena Venezia: Invasive blood pressure measurement in the PLP a-Syn mouse model of multiple system atrophy (MSA)
2. Daniel S. Silva: Role of vasopressin on intrinsic cardiac activity in conscious Wistar rats
3. Antonio Heras-Garvin: High salt diet potentiates the motor disability in a mouse model of MSA
4. Lorenz Härtner: Impaired REM sleep as a new preclinical biomarker in MSA mice
5. Andrea Maglione: Gene expression of proteins involved in inflammation and oxidative stress (OS) in commissural Nucleus of the Solitary Tract (cNTS) and Rostral Ventrolateral medulla (RVLM) in spontaneously hypertensive (SHR) and Wistar rats submitted to swimming exercise
6. Marcos Herrera Vaquero: Towards an iPSCs based model of multiple system atrophy
7. Eduardo Mazuco Cafarchio: Effects of hemorrhage and shock on urinary bladder reactivity in female Wistar rats
8. Edith Sturm: Neuroprotection by epigenetic modulation in a transgenic mouse model of multiple system atrophy

Clinical Science

9. Ruihao Wang: Autonomic challenge suggests reversibility of Fingolimod induced cardiovascular autonomic changes
10. Carmen de Rojas Leal: Altered cardiovagal responses to autonomic challenge after six months of Fingolimod
11. Sankanika Roy: Short- and long-term effects of Fingolimod on cardiovagal gain in patients with relapsing-remitting multiple sclerosis
12. V.K. van Wijnen: Prevalence of abnormal orthostatic blood pressure recovery patterns in suspected syncope patients in the emergency department
13. Katharina Hösl: Correlations between cardiovascular autonomic dysfunction and cognitive impairment in patients with a history of traumatic brain injury
14. Elisabetta Indelicato: Assessment of cardiovascular and sudomotor function in spinocerebellar ataxia type 2
15. Shmueli Sharon: Motor phenomena in vasovagal syncope: clinical and electrophysiological aspects and a comparison with convulsive seizures
16. Iva Stankovic : Dysautonomia in Early Parkinson's Disease: Cross-Sectional Study in Hoehn and Yahr Stage 1
17. J.S.Y. de Jong: The influence of a tertiary syncope unit on Quality of Life of patients with Transient Loss of Consciousness
18. Liu Mao: Vanilla-stimulation reveals subtle central autonomic dysregulation in patients with a history of mild traumatic brain injury
19. Mahringer Christoph: Assessment Platform for Autonomic Modulation by Postural ECG spectral Analysis
20. Daniel Santana da Silva: Cardiac autonomic modulation in child with spinal muscular atrophy (SMA) type I: Case Report
21. Cecillia Raccagni: Instrumented gait analysis using eGAIT in atypical parkinsonian disorders
22. Stephanie Mangesius: MR planimetry for the discrimination of atypical neurodegenerative parkinsonism
23. Sabine Eschlböck: Non-motor symptoms and gender differences in multiple system atrophy
24. J.P. Ndayisaba: Evaluation of cardiovascular parameters assessed by the Task Force® Monitor in patients with orthostatic dysregulation and healthy subjects
25. Christine Kaindlstorfer: Diagnostic value of cardiac 123I-MIBG SPECT/CT imaging in PD and MSA.

ABSTRACTS

1. Invasive blood pressure measurement in the PLP α -Syn mouse model of multiple system atrophy (MSA)

Serena Venezia, Daniela Kuzdas-Wood, Nadia Stefanova, Gregor K. Wenning

Division of Neurobiology, Department of Neurology, Medical University of Innsbruck, Austria

Objective: Since neurogenic blood pressure (BP) dysregulations are hallmark features of central autonomic failure in MSA, the aim of the current study is to provide BP characterization in the PLP- α -Syn MSA mice.

Background: One well-described phenomenon in MSA patients that can occur even before the onset of motor-symptoms is neurogenic orthostatic hypotension (NOH) which often presents concurrently with pathologically elevated BP at night/in resting position which is referred to as supine hypertension.

Methods: Radiotelemetry transmitters have been implanted in the carotid artery of 5 month old tg MSA mice and age-matched healthy wt controls. The recordings were performed starting on postsurgical day 10.

Results: Measurements of different parameters showed differences between values of tg and wt animals during the active as well as the inactive phase.

Conclusion: These results replicate some clinical features of autonomic failure present in MSA patients.

Acknowledgment: This study is supported by grants of the Austrian Science Fund (FWF) P25161, W1206-08, and F4414.

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2. Role of vasopressin on intrinsic cardiac activity in conscious Wistar rats

Daniel S. Silva¹, Eduardo M. Cafarchio¹, Janaína S. Souza², Leandro C. Valdo¹, Gisele Giannocco², Monica A. Sato¹

¹ Dept. Morphology and Physiology, Faculdade de Medicina do ABC, Santo Andre, SP, Brazil;

² Dept. Biological Sciences, Federal University of Sao Paulo, São Paulo, SP, Brazil

Objective: To investigate if vasopressin can influence the cardiac intrinsic activity in Wistar rats.

Background: The effects of vasopressin on cardiac chronotropism are controversial in different species.

Methods: Adult male Wistar rats underwent to a cannulation of the femoral artery and vein for mean arterial pressure (MAP) and heart rate (HR) recordings and drug infusions, respectively, in conscious rats. After baseline recordings, i.v. atropine 2mg/kg and i.v. metoprolol 1.7mg/kg were injected with 5min interval. After 10min, i.v. vasopressin 0.0625mg/mL/5min (N=6) or saline (1mL/5 min) (N=6) were infused and the variables were recorded for additional 10 min. Gene expression of V1a, V1b and V2 subtype receptors for AVP was also carried in the heart by qPCR.

ABSTRACTS

Results: Vasopressin evoked bradycardic (-51 ± 5 bpm) and pressor responses (39 ± 6 mmHg) compared to baseline post-autonomic blockade (130 ± 8 mmHg and 406 ± 16 bpm). Saline did not change HR (1 ± 4 bpm) and MAP (-3 ± 1 mmHg) compared to baseline after autonomic blockade (120 ± 5 mmHg and 411 ± 52 bpm). All subtypes of AVP receptors were expressed in the heart.

Conclusion: The bradycardia elicited by vasopressin after cardiac autonomic blockade suggests that vasopressin can affect the cardiac intrinsic activity binding to the receptors in heart.

Acknowledgment: FAPESP, CNPq and NEPAS-FMABC.

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3. High salt diet potentiates the motor disability in a mouse model of MSA

Antonio Heras-Garvin, Gregor K. Wenning and Nadia Stefanova

Department of Neurology, Medical University of Innsbruck

Objective: To analyze the effect of high salt diet in the progression of the synucleopathy in a mice model of MSA.

Background: Initial intervention to fight orthostatic hypotension in MSA is to increase intravascular fluid volume by large daily salt intake. It has been shown that high salt diet induces the activation of the innate immune system and the production of pro-inflammatory molecules in different *in vitro* and *in vivo* models of other diseases. According to that, high salt diet should be considered an environmental risk factor for inflammatory diseases. Since neuroinflammation plays an important role in MSA, the effect of high salt diet in the progression of the synucleinopathy in the PLP-haSyn mice model is being studied.

Methods: 1 year-old PLP-haSyn mice received normal or high salt diet for a period of three months. Different motor behavior analyses were performed at the end of the treatment followed by postmortem histological and molecular analyses of their brains.

Results and conclusions: High salt diet potentiates motor disability, microglial activation and inflammation in the PLP-haSyn mice. No effect has been observed in wildtype animals. Further analyses are needed to clarify if there is any correlation between the increase of motor disability and microglial activation/inflammation. However, based on these results high salt diet should be considered a possible risk factor for the progression of MSA.

This work was supported by a grant of the Austrian Science Fund (FWF F4414).

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4. Impaired REM sleep as a new preclinical biomarker in MSA mice

Lorenz Härtner¹, Tobias Keil⁴, Eva-Maria Fritzl⁴, Matthias Kreuzer³, Gregor Wenning¹, Nadia Stefanova¹ and Thomas Fenzl²

¹ Department of Neurology, Medical University of Innsbruck, Austria; ² Department of Pharmacology, Medical University of Innsbruck, Austria; ³ Neuroanaesthesia Laboratory, Emory University, USA; ⁴ Department of Pharmacology, University of Innsbruck, Austria

Objective: Characterizing the age related sleep behaviour and finding typical sleep symptoms in the PLP aSYN mouse model for multiple system atrophy (MSA).

Background: Sleep related symptoms, such as rapid eye movement sleep behavior disorder (RBD) or restless legs syndrome are very common in multiple system atrophy patients and precede MSA diagnosis. The PLP- α SYN mouse model for MSA is a very well established animal model that shows a strikingly similar behavioral phenotype.

Methods: We performed chronic, longitudinal EEG recordings in freely behaving young MSA mice without MSA-like motor symptoms and in old MSA mice showing an extensive behavioral phenotype. The recordings were completed with age-matched young and old C57BL/6 N controls (BL6).

Results: Young MSA animals showed increased rapid eye movement sleep (REMS) during the inactive period and increased spectral power of the EEG during wakefulness and REMS, compared with old MSA animals and BL6- controls. In addition, old MSA mice showed REMS without atonia (REM-A), a major symptom of RBD and MSA.

Conclusion: The finding of increased spectral power is in striking accordance to studies in humans with idiopathic REMS behavior disorder (RBD), which is a strong precursor of neurodegenerative diseases, such as MSA. We conclude that RBD like features are present in this mouse model, these parameters could also be utilized as early biomarkers for future drug screenings.

Acknowledgment: FWF SFB F4414, Tiroler Wissenschaftsfonds

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5. Gene expression of proteins involved in inflammation and oxidative stress (OS) in commissural Nucleus of the Solitary Tract (cNTS) and Rostral Ventrolateral medulla (RVLM) in spontaneously hypertensive (SHR) and Wistar rats submitted to swimming exercise

Andréa V. Maglione¹, Andressa Vendramini¹, Leandro C. Valdo¹, Janaina S. Souza², Rui M.B. Maciel², Gisele Giannocco², Monica A. Sato¹

¹ Dept. Morphology and Physiology, Faculdade de Medicina do ABC, Santo Andre, SP, Brazil;

² Dept. Biological Sciences, Federal University of Sao Paulo, São Paulo, SP, Brazil

Objective: To investigate the gene expression (g.e.) of proteins involved in inflammation and OS in the cNTS and RVLM in SHR and Wistar rats submitted to swimming exercise (SW).

Background: Inflammation and OS have been associated to cardiovascular diseases. It is unknown if SW can change the g.e. of proteins related to inflammation in medullary areas involved in cardiovascular regulation.

Methods: Male SHR and Wistar (14-16wks-old, N=24) were maintained sedentary (SED) or submitted to SW (1 h/day, 5 days/wk/6 wks). The g.e. of cyclooxygenase-2 (COX-2), interleukin 6 (IL-6), interleukin 10 (IL-10) and AT-1 receptor (AT-1r) in cNTS and RVLM was carried out by qPCR.

Results: The g.e. of COX-2 increased in SW-SHR in cNTS (1.32 ± 0.12 vs. 1.01 ± 0.05 SED) and RVLM (1.27 ± 0.08 vs. 1.01 ± 0.06 SED). The IL-6 g.e. reduced in RVLM in SW-SHR (0.14 ± 0.1 vs. 1.04 ± 0.28 SED), whereas IL-10 g.e. increased in SW-SHR (1.24 ± 0.10 vs. 0.98 ± 0.05 SED). The AT-1r g.e. decreased in SW-SHR in cNTS (0.69 ± 0.05 vs. 1.03 ± 0.08 SED) and RVLM (0.65 ± 0.04 vs. 1.02 ± 0.08 SED). No differences were observed in g.e. for those proteins in SW and SED-Wistar.

ABSTRACTS

Conclusion: The exercise induces adaptive responses in RVLM to reduce the OS dependent on AT-1r in order to reduce the inflammation that could be increased particularly in SHR.

Acknowledgment: FAPESP, CNPq, NEPAS.

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6. Towards an iPSCs based model of multiple system atrophy.

Marcos Herrera Vaquero¹, Antonio Heras Garvin¹, Georg Dechant², Sylvia Bösch¹, Gregor Wenning¹, Roxana Nat², Nadia Stefanova¹

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² Institute of Neuroscience, Medical University of Innsbruck, Austria

Objective: The goal of the project is to develop a complimentary humanized in vitro model by differentiating induced Pluripotent Stem Cells (iPSCs) from MSA patients to oligodendrocytes.

Background: Multiple System Atrophy (MSA) is a fatal progressive neurodegenerative disease featuring motor and autonomic symptoms. The neuropathological hallmark of MSA is the abnormal accumulation of alpha-synuclein in oligodendrocytes. The diseases mechanisms are poorly understood and animal models replicate only mechanistically pathogenic cascades relevant to MSA.

Methods: iPSCs were subjected to differentiation towards oligodendrocytic fate with a modified protocol of Douvaras et al 2013.

Results: After 72 days of iPSCs controlled differentiation CNPase positive cells were observed.

Conclusion: To this end we were able to achieve the stage of late oligodendrocyte precursor cells after human iPSCs differentiation.

Acknowledgment: This study was supported by grant F4414 of the Austrian Science Fund (FWF). The authors are grateful for their technical advice to Andreas Eigentler and Carlo Bavassano.

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7. Effects of hemorrhage and shock on urinary bladder reactivity in female Wistar rats

Eduardo M. Cafarchio¹, Janaina S. Souza², Daniel S. Silva¹, Luiz Augusto da Silva¹, Barbara do Vale¹, Leandro de C. Valdo¹, Daniel P. Venâncio¹, Bruno B. Antonio¹, Gisele Giannocco², Monica A. Sato¹

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² Dept. Biological Sciences, Federal University of Sao Paulo, São Paulo, SP, Brazil

Objective: To investigate if hemorrhage and shock affect urinary bladder reactivity in female Wistar rats.

Background: Hemorrhage and shock induce plasma vasopressin release. Intravenous vasopressin injection increases intravesical pressure. It is unknown if the urinary bladder reactivity changes during hemorrhage and shock.

Methods: Adult female Wistar rats (N=6) anesthetized with 2% isoflurane in 100% O₂ underwent to a cannulation of the femoral artery for mean arterial pressure and heart rate recordings, and femoral vein for blood withdrawal to induce hemorrhage and shock. The urinary bladder was cannulated for intravesical pressure (IP) recordings and drugs (vasopressin 1ng/mL, acetylcholine 2ug/mL, and noradrenaline 2ug/mL) were dropped (0.1 mL) on the urinary bladder.

ABSTRACTS

Results: The IP responses to vasopressin ($24\pm 1\%$ vs. $86\pm 1\%$ control), acetylcholine ($79\pm 2\%$ vs. $162\pm 5\%$ control), and noradrenaline ($-23\pm 1\%$ vs. $-38\pm 2\%$ control) were attenuated in hemorrhage rats. Under shock, the IP responses to vasopressin ($14\pm 1\%$ vs. $86\pm 1\%$ control) and acetylcholine ($36\pm 1\%$ vs. $162\pm 5\%$ control) were strongly reduced whereas the response to noradrenaline ($7\pm 1\%$ vs. $-38\pm 2\%$ control) was abolished.

Conclusion: Rats under hemorrhage decreased the urinary bladder reactivity to vasopressin and to the transmitters released by the autonomic nervous system innervation. The decline in urinary bladder reactivity was enhanced under shock.

Acknowledgment: FAPESP, CAPES and NEPAS-FMABC.

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8. Neuroprotection by epigenetic modulation in a transgenic mouse model of multiple system atrophy

Edith Sturm, Lisa Fellner, Florian Krismer, Werner Poewe, Gregor K. Wenning, Nadia Stefanova

Department of Neurology, Innsbruck Medical University, Innsbruck, Austria

Objective: To identify novel therapeutic targets for multiple system atrophy (MSA) through histone deacetylase (HDAC) inhibition by sodium phenylbutyrate (NaPB), a non-selective pan-HDAC inhibitor.

Background: MSA is a fatal neurodegenerative disorder with rash progression and late disease onset. MSA is characterized by oligodendroglial cytoplasmic inclusions (GCIs)¹, selective neuronal loss and gliosis leading to parkinsonism, autonomic failure and cerebellar ataxia². There is no cure of MSA. However, it has been shown that HDACs have an important role in the pathogenesis of neurodegenerative diseases. HDAC inhibition is neuroprotective in models of Parkinson's disease³ and amyotrophic lateral sclerosis⁴.

Methods: Transgenic mice overexpressing human alpha-synuclein in oligodendroglia received NaPB (200mg/kg) or saline for eight weeks daily. Behavioral tests were performed; immunohistochemistry and western blotting were applied.

Results: NaPB treatment of MSA mice resulted in increased H3 acetylation, was associated with improved motor behavior, neuroprotection of nigral dopaminergic neurons and reduced GCI density. Conclusion: NaPB has a significant neuroprotective effect in MSA mice. It is of great importance that epigenetic mechanisms including histone modifications should be investigated further as potential targets in MSA therapy, since this can also be related to familiar diseases.

Acknowledgement: Austrian Science Funds (FWF) F4404 and P25161.

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¹ Papp, M.I., Kahn, J.E., Lantos, P.L. 1989, Govindarajan, N. et al. 2011

² Wenning, G.K. et al. 2004

³ Roy, A. et al. 2012

⁴ Cudkovicz, M.E. et al. 2009

9. Autonomic challenge suggests reversibility of Fingolimod induced cardiovascular autonomic changes

Ruihao Wang¹, Carmen de Rojas Leal¹, Sankanika Roy¹, Mao Liu¹, Francesca Canavese¹, Katharina M. Hösl², Klemens Winder¹, De-Hyung Lee¹, Ralf A. Linker¹, Max J. Hilz^{1,2}

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³ Dept. of Psychiatry and Psychotherapy, Paracelsus Medical University, Nuremberg, Germany

Objective: To assess cardiovascular autonomic responses to autonomic challenge in patients with relapsing-remitting multiple sclerosis (RRMS) during and after Fingolimod-therapy.

Background: Long-term Fingolimod-therapy may alter cardiac autonomic modulation in RRMS-patients. Autonomic effects of Fingolimod-discontinuation are unknown.

Methods: In 7 RRMS-patients (mean age 34.3 ± 9.4 years, six women) who were on Fingolimod-therapy for 7 to 21 months but then discontinued treatment, we monitored monitored RR-intervals (RRI), systolic, diastolic blood pressure (BPsys, BPdia), and respiration (RESP) during metronomic deep breathing (MDB), Valsalva-Manoeuvre, and active standing-up. Measurements were performed before and after six months of continuous Fingolimod-therapy, and 7.1 (3.2; 15.0) months (median; lower, upper quartile) after Fingolimod-discontinuation. We calculated expiratory-inspiratory-ratios (E/I-ratios) during MDB, Valsalva ratios (VRs), and 30/15-RRI-ratios upon standing-up. Values were compared between different time-points (Friedman test, with post-hoc Wilcoxon-test, significance: $p < 0.05$).

Results: E/I-ratios slightly but not significantly decrease after six months of Fingolimod-therapy ($p = 0.063$) but significantly increased after Fingolimod-discontinuation. VRs and 30/15-RRI-ratios significantly decreased after six months of Fingolimod-therapy but significantly increased after Fingolimod-discontinuation.

Conclusions: Long-term Fingolimod-treatment dampens cardiovagal responses to challenge manoeuvres. After Fingolimod-discontinuation, cardiovagal responses to challenge recover. These results suggest that Fingolimod effects on cardiac autonomic modulation may be reversible.

Acknowledgment: We thank Mr. Beate Beck and Mr. Barbara Kraus for technical assistance and data collection.

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10. Altered cardiovagal responses to autonomic challenge after six months of Fingolimod

C. de Rojas Leal¹, R. Wang¹, S. Roy¹, M. Liu¹, F. Canavese¹, K. Hösl², K. Winder¹, D.-H. Lee¹, R.A. Linker¹, M. Hilz^{1,3}

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² Department of Psychiatry and Psychotherapy, Paracelsus Medical University, Nuremberg, Germany;

³ Institute of Neurology, University College London, Queen Square, London, UK

Objective: To assess cardiovascular responses to autonomic challenge manoeuvres in multiple sclerosis (MS) patients after six months of Fingolimod-therapy.

Background: In MS-patients, several months of Fingolimod-therapy might dampen cardiac autonomic modulation at rest (Hilz et al., Neurology, 2016: P5.119.). Effects of prolonged Fingolimod-therapy on cardiovascular responses to autonomic challenge are unknown.

Methods: In 15 MS-patients (10 women, age 32.9 ± 9.7 years, EDSS 2.27 ± 1.46), we monitored respiration, RR-intervals and blood pressure during metronomic deep breathing (MDB), Valsalva-Manoeuvre, and active standing-up. Measurements were performed before and six months after Fingolimod-therapy. We calculated expiratory-inspiratory-ratios (E/I-ratios) during MDB, Valsalva ratios (VRs), and 30/15-RRi-ratios upon standing-up. Values were compared before and six months after Fingolimod-therapy (paired t-test for normally distributed values; Wilcoxon-test for non-normally distributed values; significance: $p < 0.05$).

Results: Values were significantly reduced six months after than before Fingolimod-initiation for E/I-ratios (1.57 ± 0.25 vs. 1.28 ± 0.12 ; $p < 0.001$), 30/15-RRi-ratios (1.35 ± 0.26 vs. 1.20 ± 0.12 ; $p = 0.001$) and VRs (1.78 ± 0.44 vs. 1.44 ± 0.26 ; $p = 0.043$).

Conclusion: The findings of reduced respiration-associated cardiovagal modulation, decreased cardiovagal withdrawal upon baroreflex-unloading, and decreased cardiovagal-buffer capacity upon baroreflex-loading show that Fingolimod not only alters resting autonomic modulation (Hilz et al., Neurology, 2016: P5.119.) but impairs cardiovagal responses to challenge after six months of treatment.

Acknowledgment: We thank Mr. Beate Beck and Mr. Barbara Kraus for technical assistance and data collection.

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11. Short- and long-term effects of Fingolimod on cardiovagal gain in patients with relapsing-remitting multiple sclerosis

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Objective: To evaluate the chronologic changes of CVG with Fingolimod-initiation in RRMS patients.

Background: Fingolimod, an oral disease-modifying therapy for patients with relapsing-remitting multiple sclerosis (RRMS) has been shown to have a transient vagomimetic effect. However, the transient and long-term effect of Fingolimod on the cardiovagal gain (CVG) has not been studied yet.

Methods: In 21 patients, we recorded RR-intervals (RRIs) and systolic blood pressure (BPsys) during Valsalva maneuver (VM) at 0.5, 1, 2, 3, 4, 5, 6 hours and 6 months after Fingolimod initiation. We quantified CVG from the slope of the relationship between RRIs and BPsys during early phase II of the VM.

Results: There was a gradual increase in the CVG after Fingolimod initiation reaching its nadir at the 4th hour (3.92 ± 2.02 vs. 5.39 ± 3.48 ms/mmHg; $p=0.027$) followed by a gradual decrease and reaching the pre-Fingolimod CVG state at the 6th hour (3.92 ± 2.02 vs 3.90 ± 4.53 ms/mmHg; $p=0.985$). However, after 6 months of Fingolimod-therapy, the CVG was significantly lower than pre-Fingolimod values (3.92 ± 2.02 vs. 1.84 ± 1.26 ms/mmHg; $p=0.006$).

Conclusion: The long-term effect of Fingolimod is a significant decrease in CVG which could be attributed to the central autonomic network readjustment for counter-regulating the vagomimetic effects of Fingolimod in RRMS patients.

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12. Prevalence of abnormal orthostatic blood pressure recovery patterns in suspected syncope patients in the emergency department.

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Objective: To determine the prevalence of abnormal orthostatic blood pressure (BP) patterns in suspected syncope patients in the emergency department (ED).

Background: Measurement of orthostatic BP is part of the initial evaluation of patients with suspected syncope in the ED. Non-invasive continuous BP measurement is increasingly used to study orthostatic BP recovery patterns. Little is known about the applicability of continuous non-invasive orthostatic BP measurement in the ED and the prevalence of abnormal orthostatic BP patterns in suspected syncope patients.

Methods: In a cross-sectional study 116 patients (51,7% male, age 58,4y($\pm 20,7$)) with suspected syncope referred to the ED were included. Orthostatic BP was measured during the active lying-to-standing test with non-invasive continuous BP measurement. Orthostatic BP patterns were defined as normal BP recovery, initial orthostatic hypotension, slow BP recovery, orthostatic hypotension and reflex syncope.

Results: One hundred and ten (94,8%) files were suitable for analysis. Normal recovery was present in 47 patients (42,7%), initial orthostatic hypotension in 16 (14,5%), slow recovery in 21 (19,1%), orthostatic hypotension in 21 (19,1%) and reflex syncope in 5 (4,5%).

Conclusion: Non-invasive continuous BP measurement is applicable in 94,8% of the suspected syncope patients in the ED and the majority (56,7%) of patients did not have a normal BP recovery pattern.

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13. Correlations between cardiovascular autonomic dysfunction and cognitive impairment in patients with a history of traumatic brain injury

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Objective: To investigate possible correlations between cardiovascular autonomic dysfunction and cognitive impairment in patients with a history of traumatic brain injury (TBI).

Background: TBI-related brain lesions may occur in areas responsible for both cardiovascular autonomic modulation and cognitive function. Recent studies suggest links between cognitive and cardiovascular autonomic dysfunction (Thayer et al., 2009. *Ann Behav Med.*). We, therefore, hypothesize that there is an association between both dysfunctions in post-TBI-patients.

Methods: In 86 post-TBI-patients (33.13±10.84 years old, 22 women, 36.8±28.9 months after injury), we monitored RR-intervals (RRI), systolic, diastolic blood pressures (BPsys, BPdia), and respiration (RESP) at rest. We calculated parameters of total cardiac autonomic modulation [RRI-standard-deviation (RRI-SD), RRI-coefficient-of-variation (RRI-CV), RRI total powers], sympathetic [RRI low frequency powers (RRI-LF), BPsys-LF-powers] and parasympathetic cardiac modulation [Root-Mean-Square-of-Successive-RRI-Differences (RMSSD), RRI-high-frequency-powers (RRI-HF)], sympathetic-parasympathetic balance (RRI-LF/HF-ratios), and baroreflex-sensitivity (BRS). We assessed executive function using the standardized Trail-Making-Test (TMT, part A and B). We assessed correlations between autonomic and cognitive parameters (Spearman-rank-correlation-test, significance: p<0.05).

Results: TMT-A negatively correlated with RRI-HF-powers and BRS, TMT-B positively correlated with RRI-LFnu-powers, RRI-LF/HF-ratios, BPsys-LF-powers, and negatively correlated with RRI-HFnu-powers.

Conclusions: In post-TBI-patients, increasingly severe cognitive dysfunction is associated with decreasing cardiovagal modulation and baroreflex sensitivity, and a shift towards sympathetic predominance.

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14. Assessment of cardiovascular and sudomotor function in spinocerebellar ataxia type 2

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Objective: To assess cardiovascular and sudomotor function in Spinocerebellar ataxia 2 (SCA2)

Background: SCA2 is an autosomal dominant disorder caused by a CAG triplet expansion.

Clinically SCA2 is characterized by progressive ataxia with additional features such as pyramidal signs, Parkinsonism and dementia. Olivopontocerebellar atrophy and dopaminergic denervation are the typical pathological findings. Neurodegeneration in brainstem autonomic nuclei has also been reported, but data about clinical correlates are rather inconclusive.

Methods: Eight patients from 5 SCA2 pedigrees were enrolled. Autonomic function was evaluated by mean of a cardiovascular tests battery and through the assessment of the skin sympathetic reflex. Autonomic symptoms were investigated by means of the SCOPA-AUT questionnaire.

Results: None of the patients displayed an orthostatic hypotension, but a blunted deep breathing ratio was found in 2 of them. The skin sympathetic reflex was not inducible in 3 out of 6 patients. None of the patients had orthostatic complaints, but urinary, gastrointestinal and sweating disturbances were reported (mean SCOPA-AUT score 9, range: 3-31).

Conclusion: Together these findings point to a selective involvement of some autonomic domains in SCA2 patients which is likely influenced by multiple factors such as further genetic determinants.

15. Motor phenomena in vasovagal syncope: clinical and electrophysiological aspects and a comparison with convulsive seizures

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Introduction: Myoclonic jerks are common in vasovagal syncope (VVS). We assessed motor phenomena in VVS and convulsive seizures (CS) to aid differential diagnosis, and studied the association between motor phenomena and EEG patterns.

Methods: We studied video-EEG records of tilt-table induced VVS and CS of subjects >15 years. Definite VVS was defined using the triad: (1) loss of consciousness, (2) circulatory changes (abrupt blood pressure decrease with or without bradycardia/asystole), and (3) EEG changes (slow or slow-flat-slow). We studied tonic postures and jerks of the arms and noted time of occurrence, laterality, synchronicity and rhythmicity (mean consecutive differences (MCD)) of interclonic intervals (ICI).

Results: Video-EEG records of 65 VVS cases and 50 CS were included. In VVS postures occurred in 42 cases (65%) and jerks in 33 (51%). Mean number of jerks in CS (62 ± 36 , range 20-191) was higher than in VVS (4 ± 3 , range 1-19; $p < 0.001$). Jerks were more rhythmic in CS compared to VVS ($p < 0.001$). Jerks predominantly seen during the slow and postures during the flat EEG phase.

Discussion: Jerks were common in VVS, but semiology differed from that of CS: fewer in number, less rhythmic and coincided with loss of tone. The lack of any overlap in the number of jerks suggests that less than 10 signifies syncope and more than 20 a CS ('10/20 rule'). These features may help to distinguish syncope from epilepsy.

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16. Dysautonomia in Early Parkinson's Disease: Cross-Sectional Study in Hoehn and Yahr Stage 1

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Objective: To define frequency, severity and predictors of dysautonomia in patients with Parkinson's disease (PD) at the stage of hemiparkinsonism with disease duration less than 2 years.

Background: Autonomic failure may be present at the time of PD diagnosis. Relatively little data is available on specific profile and clinical correlates of dysautonomia in early PD.

Methods: The study comprised 112 PD patients and 79 healthy controls (HC). Autonomic dysfunction was assessed using SCOPA-AUT. Each subject underwent clinical and cognitive evaluation with MDS-UPDRS and ACE-R and screening for depression, anxiety, apathy using rating scales.

Results: PD patients had more cardiovascular, gastrointestinal, urinary, genital and thermoregulatory dysfunction compared to HC. Nocturia (37.5%) and impotence (37.9%) followed by constipation (29.46%) were the most frequent symptoms in PD patients. Twenty-two (27.67%) PD patients had one, 21 (18.75%) had two and 19 (16.96%) had three autonomic systems impaired. Total autonomic score correlated to age, depression, anxiety, apathy and LED, but not to UPDRS-motor and ACE-R scores. Older age and depression were predictors of gastrointestinal, urinary and sexual dysfunction. Higher motor scores contributed to the sexual dysfunction together with depression and age. Higher doses of dopaminergic medications were the only predictor of cardiovascular dysautonomia.

Conclusion: This is longitudinal study and we believe to report the follow-up analysis data soon.

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17. The influence of a tertiary syncope unit on Quality of Life of patients with Transient Loss of Consciousness

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Objective: To study the Quality of Life (QoL) of patients with Transient Loss of Consciousness (T-LoC) after a visit to the tertiary Syncope Unit (SU).

Background: Patients with T-LoC have a low QoL due to fear and worries on the underlying problem. The influence of a visit to a tertiary SU – addressing these issues specifically - on the QoL of these patients is unknown.

Methods: Patients received two QoL questionnaires before the visit, and after three months. The Syncope Functional Status Questionnaire, to measure the disease-specific QoL, and the Short Form-12, to measure the physical and mental generic QoL.

Results: 218 out of 252 patients returned baseline and follow-up questionnaires. The disease specific QoL showed a clinically important improvement after three months (43.4 ± 27.2 vs. 33.0 ± 26.9 , $p < 0.001$, $d = 0.4$). The physical generic QoL score showed a statistically significant, but not clinically meaningful improvement after three months (39.3 ± 11.5 vs. 40.8 ± 13.07 , $p = 0.041$, $d = 0.1$). The mental generic QoL showed no change after three months (45.2 ± 10.8 vs. 46.1 ± 14.2 , $p = 0.352$, $d = 0.1$).

Conclusion: The disease specific QoL of patients with T-LoC improved after three months. This improvement was significant, but also clinically relevant. The generic QoL did not show a relevant change.

18. Vanilla-stimulation reveals subtle central autonomic dysregulation in patients with a history of mild traumatic brain injury

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Objective: To evaluate effects of Vanilla-stimulation on cardiovascular autonomic modulation in patients with a history of mild traumatic brain injury (post-mTBI-patients).

Background: Cardiovascular autonomic effects of Vanilla-stimulation are unknown in post-mTBI-patients.

Methods: In 17 healthy persons (30.0 ± 11.5 years; 8 women) and 14 post-mTBI-patients (38.3 ± 12.9 years; 3 women), we monitored respiration, RR-intervals (RRIs), systolic and diastolic blood pressure (BP_{sys} , BP_{dia}) at rest and during three series of six 1-second Vanilla stimuli. After stimulation, participants rated "Pleasantness" and "Familiarity" from 1 to 9. We calculated RRI-standard-deviation (RRI-SD), RRI-coefficient-of-variation (RRI-CV), RRI-low-frequency (LF: 0.04-0.15 Hz)-powers and normalized LF-powers (RRI-LFnu), BP_{sys} -LF-powers, RMSSD, RRI-high-frequency (HF: 0.15-0.5 Hz)-powers, RRI-HFnu, RRI-LF/HF-ratios, and baroreflex sensitivity (BRS).

Results: Vanilla-stimulation decreased BP_{sys} (129.9±9.7 mmHg vs. 126.8±10.8 mmHg) and BP_{dia} (68.3±6.8 mmHg vs. 66.1±7.4 mmHg), and increased RRI-HF-powers (1178.5±1302.3 ms² vs. 1524.5±1887.1 ms²) significantly in healthy persons but not in post-mTBI-patients. Pleasantness correlated positively with RRI-HF-powers, RRI-HFnu, RMSSD and BRS, but negatively with RRI-LFnu, RRI-LF/HF-ratio and BP_{sys} -LF-powers; Familiarity correlated positively with RRI-HF-powers and RRI-HFnu but negatively with RRI-LFnu in healthy persons but not in post-mTBI-patients.

Conclusion: Vanilla-stimulation increased parasympathetic modulation and decreased sympathetic modulation in healthy persons, depending on the perceived Pleasantness and Familiarity. Absence of such responses in the post-mTBI-patients suggests central autonomic dysregulation.

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19. Assessment Platform for Autonomic Modulation by Postural ECG spectral Analysis

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Objective: Recent data highlights frequent autonomic dysfunction (AD) in Alzheimer's dementia and frontotemporal dementia behavioural variant, however history taking in those patients is insufficient [1, 2]. Therefore clinicians lack knowledge on AD outside standardized laboratory evaluation. To gather ambulatory data, we present a new self developed software tool combining standard holter electrocardiogram (ECG) data with 3D movement data.

Background: Groups of demented patients show significantly different spectral modulation of the heart rate variability (HRV) after head up tilt (HUT) considering the presence of an AD. The absence of changes in the low frequency (LF) band hints at a hampered autonomic modulation after postural challenge [3]. Hence evaluation of multiple postural changes from the supine to the standing position recorded over several hours either intra- or extramural could support the detection of AD.

Methods and Results: A light, waist attached device (6x8x2cm) is the data source of ECG epochs dedicated to specific postural states by simultaneously recording 3D accelerometer data. Postural triggered spectral modulation is evaluated by wavelet transformation and bandpass filtering.

Conclusion: The presented software tool will in the next step be employed in a prospective evaluation of demented patients on the ward and in ambulatory settings.

2 Mahringer, Struhal, et al.

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20. Cardiac autonomic modulation in child with spinal muscular atrophy (SMA) type I: Case Report

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Objective: To evaluate the heart rate variability (HRV) in a child with SMA type I, during awake and sleep states under non-invasive mechanic ventilation (NIMV).

Background: The SMA is a genetic disease with neuromuscular impairment due to the degeneration of motor neurons in the spinal cord. Very few is known about the cardiac autonomic modulation in patients with SMA during awake and sleep states.

Methods: The R-R intervals were obtained using a cardiofrequencymeter Polar RS800CX in a child under NIMV. In the first day, the data was collected in the awake child in supine position for 15 minutes. In the second day, the data was collected while the child was sleeping in supine position for 15 minutes. The HRV was analysed using the Kubios software in the time and frequency domains.

Results: In the time domain, the SDNN in awake and sleep were 16.5 and 26.5 ms, respectively. In the frequency domain, the normalized LF/HF ratio was increased during sleep (8.5) compared to awake state (4.3).

Conclusion: The child showed a decreased HRV during the awake state and a higher sympathetic modulation and reduced vagal modulation on the heart during sleep, suggesting an increased cardiovascular risk.

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21. Instrumented gait analysis using eGAIT in atypical parkinsonian disorders

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Background and objectives: Gait impairment is a typical feature of idiopathic Parkinson's disease (iPD) and Multiple System Atrophy (MSA). Data on the quantitative/objective assessment of gait impairment in MSA are not available but desirable for the diagnostic workup and as potential motor endpoints in treatment trials. Primary objective of this study was to identify quantitative markers of gait impairment in patients with iPD, MSA and healthy controls by using the automated, sensor-based gait analysis system "eGalT". Secondary objective was to correlate eGalT based gait signatures with clinical rating scales.

Subjects and Methods: Ambulatory patients with iPD and MSA matched for global disability (Hoehn and Yahr score ≤ 3) were recruited at the Movement Disorders Units in Innsbruck and Erlangen and assessed clinically, including validated rating scales. Gait analysis was performed by eGalT, consisting of inertial sensor units attached laterally to shoes.

Results: Most of the spatiotemporal gait parameters were impaired in patients. Gait speed and stride length were more impaired in patients with MSA despite similar global Hoehn and Yahr scores, suggesting that eGalT is able to detect pathological gait signatures and to discriminate between patient groups. Moreover, we found significant correlations between clinical rating scores and gait parameters.

Conclusion: Our preliminary findings show that patients with MSA had more severely impaired eGalT parameters than iPD patients despite similar disease stages. Our data support that instrumented gait analysis provides rater independent parameters that can be exploited for clinical trials and home-based clinical care.

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22. MR planimetry for the discrimination of atypical neurodegenerative parkinsonism

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Background: Brainstem derived MR planimetric measures have been suggested for the differential diagnosis of progressive supranuclear palsy from other neurodegenerative parkinsonian syndromes. However, it remains unclear which provides the best diagnostic accuracy.

Objective: To evaluate different MR planimetric measures for the differential diagnosis of PSP from multi system atrophy (MSA) in a large cohort of patients with atypical neurodegenerative parkinsonism.

Methods: Midbrain diameter, midbrain area, midbrain-to-pontine diameter ratio (Md/Pd), midbrain-to-pontine area ratio (M_A/P_A) and MR Parkinsonism Index (MRPI) were assessed in a prospective cohort of patients with PSP (n=23), Parkinson's disease (PD; n=40) and MSA (16 parkinsonian (MSA-P); 6 cerebellar variant of MSA (MSA-C)). Optimal cut-offs derived were then applied on a large retrospective cohort of 72 PSP (45 Richardson Syndrome (RS); 17 parkinsonian variant of PSP (PSP-P); 10 corticobasal syndrome (CBS)) and 75 MSA patients (55 MSA-P; 20 MSA-C), as well as a cohort of 84 early, clinically uncertain parkinsonian syndromes (CUPS) to assess discriminative power.

Results: Disease duration and H&Y stage ($p=1.00$) did not differ between PSP and MSA patients, in neither cohort.

For the differential diagnosis of PSP patients versus MSA patients the MRPI (>15.7) was the best predictor (predictive accuracy of 94.16%) with no false positives, followed by Md/Pd (<0.495) and M_A/P_A (<0.185) (91.97% for both).

For differentiation of the PSP-P versus MSA the MRPI yielded an accuracy of 93.5% and no false positives. Area (90.22%) and midbrain ratios (91.30%) showed minor differences.

Diagnostic accuracy for differentiating RS from MSA was best using the MRPI (98.33% with no false positives), whereas the midbrain-to-pontine ratios both had had an accuracy of 95%.

Application of the calculated cut-offs in the CUPS cohort yielded the highest accuracy (89.66%) for the differential diagnosis of PSP versus MSA for both, M_A/P_A and MRPI, and had no false positives.

Conclusion: Brainstem-derived planimetric measures are reliable imaging parameters in the differential diagnosis of atypical parkinsonian syndromes, even at early, clinically still uncertain stages. For the differentiation of PSP from MSA, MRPI showed best results with no false positives in all cohorts evaluated.

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23. Non-motor symptoms and gender differences in multiple system atrophy

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Objective: To determine the frequency and gender differences of non-motor symptoms (NMS) in patients with multiple system atrophy (MSA).

Background: NMS are a core feature in MSA and may precede onset of motor symptoms. Although NMS are gaining awareness as significant cause of morbidity, the frequency of symptoms among MSA subtypes and gender differences remain to be thoroughly characterized.

Methods: The clinical features of patients diagnosed clinically as probable or possible MSA who were treated at the movement disorder unit of Innsbruck, Austria between 2000-2016 were analysed. NMS covering autonomic, neuropsychiatric, sleep and olfactory domains were evaluated based on a review of medical records. Descriptive statistics of nominal and ordinal variables were performed and appropriate parametric or non-parametric tests were applied.

Results: Data from 175 MSA patients (51.4 % men) were included in the analysis. Early autonomic dysfunction as defined by occurrence of at least one symptom within 1 year of motor onset was recorded in 49.1 % of the patients. Overall the most frequent NMS reported by patients at any time throughout the disease course were bladder symptoms (94.8 % of cases), depression (80.7 %) and symptoms of REM sleep behavior disorder (78.8 %) followed by postural dizziness/ syncope (77.8 %) and constipation (75.2 %). Sleep-related breathing disturbance occurred in 66.1 % of patients. Up to 82.9 % of patients experienced at least three symptoms of the non-motor complex. Constipation and sudomotor symptoms were more prevalent in MSA-P (parkinsonian variant) patients compared to MSA-C (cerebellar variant) patients ($p < 0.05$). The most frequent NMS in men was impotence (96.6 %), and in women urinary urgency (95.8 %). Except for depression which occurred more frequently in women than in men ($p = 0.04$), the frequency of NMS during the entire disease course was comparable between male and female patients. In contrast early autonomic failure was more prevalent in male patients (58.9 % in male vs. 38.8 % in female, $p = 0.008$).

Conclusion: Our data show that NMS are prominent in MSA likely affecting quality of life. Gender differences were apparent for depression (women > men) and early autonomic failure (men > women). Further prospective studies are required to confirm our results.

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24. Evaluation of cardiovascular parameters assessed by the Task Force® Monitor in patients with orthostatic dysregulation and healthy subjects

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Background and objective: Since 2004, the beat-to-beat blood pressure monitor Task Force® Monitor (TFM, CNSystems, Austria) has been employed in the Innsbruck tilt-table laboratory as a non-invasive tool for continuous monitoring of cardiovascular autonomic function parameters. Purpose of the present study was to evaluate the TFM parameters in patients presenting with orthostatic complaints compared to healthy subjects.

Patients and Methods: We included retrospectively 109 patients recruited between 2009 and 2010 with the following diagnoses according to standard criteria: orthostatic hypotension (OH, n=29), Postural Tachycardia Syndrome (PoTS, n=34) as well as vasovagal syncope (VVS, n=46). These patients were compared to a group of age and sex matched healthy controls (HC, n=79). We analyzed sympathetic and parasympathetic function using orthostatic changes of total peripheral resistance (TPR) and stroke volume (SV) and supine values of cardiovagal baroreceptor reflex sensitivity (BRS) and various parameters of heart rate variability (HRV) and blood pressure variability (BPV) including RMSSD (square root of the mean squared differences of successive R-R intervals; a parasympathetic index) and LF/HF ratio (low frequency/high frequency). Differences between groups were evaluated using generalized estimating equations (GEE) and univariate analysis of variance (ANOVA).

Results: GEE and ANOVA revealed significant differences between the groups: (i) there was a lack of orthostatic TPR increase in all patient groups compared to HC ($p < 0.001$); (ii) orthostatic changes of SV and supine values of BRS and RMSSD were attenuated in VVS ($p < 0.001$, $p = 0.018$, $p = 0.035$ respectively) compared to HC; (iii) supine LF/HF ratio of BPV was greater in HC than in OH ($p = 0.013$) and PoTS ($p = 0.004$).

Conclusion: TFM parameters such as TPR, SV, and BRS appear to represent useful diagnostic markers of orthostatic disorders.

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25. Diagnostic value of cardiac ^{123}I -MIBG SPECT/CT imaging in PD and MSA

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Objective: The aim of this study was to determine the diagnostic accuracy of cardiac ^{123}I -metaiodobenzylguanidine (MIBG)-SPECT/CT imaging in discriminating MSA-P and PD patients.

Background: Cardiac ^{123}I -MIBG SPECT imaging of the heart provides a measure of cardiac sympathetic innervation and has been used extensively as an additional pointer in differentiating PD from atypical parkinsonian disorders including MSA. However, much less is known about the diagnostic value of ^{123}I -MIBG-SPECT and low-dose-CT co-registration. Latter approach allows attenuation correction of SPECT images and fusion of the anatomic details from CT and the functional information from SPECT.

Material and methods: We conducted a prospective study including 16 PD and 7 MSA-P patients. Patients were matched for age and motor disability. All patients underwent thoracic ^{123}I -MIBG SPECT/CT imaging. Disease severity was assessed using the Hoehn & Yahr (H&Y), UMSARS and UPDRS scales. Data are presented as mean \pm SD. Statistical analyses were performed using Fishers Exact Test, Student's T test and Wilcoxon Mann Whitney U test as appropriate.

Results: Mean age at examination was 65 years \pm 2,2 years in PD and 65 years \pm 3,0 in MSA patients, mean disease duration was 7 \pm 0,7 years in PD and 4 \pm 1,1 years in MSA. Total UMSARS score in MSA was 46,3 \pm 3,6 (UMSARS I 22,7 \pm 1,9; UMSARS II 23,7 \pm 1,4 and global disability scale 3 \pm 0,4). Total UPDRS score in PD was 72 \pm 2,2 (UPDRS I 12 \pm 1,1; UPDRS II 17 \pm 1,1; UPDRS III 38 \pm 2,1; UPDRS IV 6 \pm 1,1). We detected a significant difference in cardiac uptake of ^{123}I -MIBG between PD and MSA patients: 88% of PD patients had a pathological finding on ^{123}I -MIBG SPECT/CT imaging whereas only 43% of MSA patients showed abnormal cardiac sympathetic innervation ($p = 0.045$). The corresponding odds ratio for a diagnosis of MSA was 3.8. Sensitivity and specificity were 57, 14% and 87,50%, respectively.

Conclusions: In our cohort, MSA-P patients more frequently showed decreased cardiac sympathetic innervation than previously reported. This finding is most likely attributable to the more detailed ^{123}I -MIBG SPECT/CT imaging approach used in our study. Nevertheless, the presence of normal cardiac sympathetic innervation strongly supports a diagnosis of MSA-P.

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