Neurophysiological and Clinical Aspects of Vestibular Disorders

Advances in
Oto-Rhino-Laryngology

Vol. 30

Series Editor
C. R. Pfaltz, Basel


8th Extraordinary Meeting of the Brny Society, Basel, June 22-25, 1982

Neurophysiological and
Clinical Aspects of
Vestibular Disorders

Volume Editor
C. R. Pfaltz, Basel

134 figures and 39 tables, 1983


Advances in Oto-Rhino-Laryngology

National Library of Medicine, Cataloging in Publication
Brny Society. Extraordinary Meeting
(8th: 1982: Basel, Switzerland)
Neurophysiological and clinical aspects of vestibular disorders/
8th Extraordinary Meeting of the Brny Society, Basel, June 22-25, 1982;
(Advances in oto-rhino-laryngology; v. 30)
1. Labyrinth Diseases - physiopathology - congresses 2. Vestibular Apparatus - physiopathology - congresses
I. Pfaltz, C. R. (Carl Rudolf) II. Title III. Series
W1 AD701 v. 30 [WV 255 B2255 1982n]
ISBN 3-8055-3607-0

Drug Dosage
The author and publisher have exerted every effort to ensure that drug selection and dosage set
forth in this text are in accord with current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new and/or infrequently employed drug.

All rights reserved.
No part of this publication may be translated into other languages, reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, microcopying, or by any information storage and retrieval system, without permission in writing from the publisher.

Copyright 1983 by S. Karger AG, P.O. Box, CH-4009 Basel (Switzerland)
Printed in Switzerland by Basler Zeitung, Basel
ISBN 3-8055-3607-0

Contents

Preface .......................................................... XI

Neurophysiological and Clinical Aspects of the Vestibulo-Ocular and the Optokinetic Reflex

Henn, V. (Zrich): Habituation and Plasticity of the Vestibulo-Ocular Reflex.
Yagi, T.: Sekine, S. (Tokyo); Shimizu, M. (Tochigi): Age-Dependent Changes in the Gains of the Vestibulo-Ocular Reflex in Humans .............. 9
Vidal, P. P. (Paris); Roucoux, A. (Bruxelles); Berthoz, A. (Paris); Crommelinck, M. (Bruxelles): Eye Position-Related Activity in Deep Neck Muscles of the Alert Cat ............................................. 27
Tonndorf, J. (New York, N.Y.): A Mechanical View of Peripheral Vestibular
Matsuoka, I.; Ito, J.; Sasa, M.; Takaori, S. (Kyoto): Possible Neurotransmitters Involved in Excitatory and Inhibitory Effects from Inferior Olive to Contralateral Vestibular Nucleus .............................. 58
Ito, J.; Matsuoka, I.; Sasa, M.; Takaori, S. (Kyoto); Morimoto, M. (Kochi): Input to Lateral Vestibular Nucleus as Revealed by Retrograde Horseradish Peroxidase Technique. ................................. 64
Jntti, V.; Aantaa, E.; Lang, H. (Turku); Schaln, L.; Pyykk, I. (Lund): The Saccade Spike ......................................................... 71
Scholtz, H. J. (Rostock); Pyykk, I.; Henriksson, N. G. (Lund): Electrooculography of Vertical Saccades ........................................ 76
Pyykk, I. (Lund); Matsuoka, I.; Ito, S.; Hinoki, M. (Kyoto): Decrease of Integration of Optokinetic Nystagmus of Peripheral Retinal Type after Hemilabyrinthectomy ........................................ 88
Bttner, U. (Zrich); Meienberg, O. (Bern); Schimmelpfennig, B. (Zrich): The Effect of Central Retinal Lesions on Nystagmus in the Monkey during Visual-Vestibular Conflict Stimulation .............................. 94
Miyoshi, T.; Tamada, A. (Kyoto): Optokinetic Stimulation and Body Balance .. 102
Tamada, A.; Miyoshi, M.; Ito, S. (Kyoto); Hiwatashi, S. (Osaka): Effect of Velocity, Amplitude (Stripe Distance) and Frequency of the Target on Eye-Tracking Test and Optokinetic Nystagmus ......................... 108
Halama, A. R. (Krakow): Optokinetic Nystagmus Pattern in Subjects Exposed to Prolonged Local Vibrations .......................... 125
Lng, J.; Mester, A. F. (Budapest): Optokinetometry: A Diagnostic Tool in Multiple Content VI
Vestibular Tests and Diagnosis of Intracranial Pathology by Neuro-Otological Approaches

Helms, J.; Abdel Aziz, M. Y.; Maurer, K. (Mainz): Experiences with Neuro-Otological Procedures in the Diagnosis of Intracranial Pathology ........ 131
Kumar, A.; Torok, N. (Chicago, Ill.): Neurotological Diagnosis of Intracranial Lesions .............................................. 138
Huygen, P. L. M. (Nijmegen): Vestibular Hyperreactivity in Patients with Multiple Sclerosis .............................................. 141
Kanzaki, J.; O-Uchi, T. (Tokyo): Ocular Fixation Test during Damped Pendular Rotation Test and Auditory Brain Stem Response for the Differential Diagnosis of Central Vestibular Disorders ........................ 156
Probst, R.; Aoyagi, M.; Pfaltz, C.R. (Basel): Diagnosis of Peripheral and Central Vestibular Lesions by the Harmonic Acceleration Test. .............. 159
Hamid, M. A. (Cleveland, Ohio): Reducing the Simple Harmonic Acceleration Test Time ...................................................... 165
Rubin, W. (Metairie, La.): Harmonic Acceleration Tests for Measuring Vestibular Compensation ............................................ 171
Piffk, P.; Gdor, I. (Budapest): Differential Diagnosis of Acoustic Neurinomas. 177
Diamond, S. G.; Markham, C H. (Los Angeles, Calif.): Ocular Counterrolling during Constant Velocity Roll in Patients with Brainstem Compression. .. 183
Schaln, L.; Pyykk, I.; Henriksson, N. G. (Lund); Jntti, V. (Turku); Wennmo, C (Lund): Does the Spontaneous Nystagmus Interfere with Eye Tracking? .. 201
Diagnoses of the Central Nervous System. .......................... 205
Abnormal Eye Movement and Nystagmus in the Case of Cerebellar Lesion. 210
with Slow Eye Movement ............................... 214

Visual-Vestibular Interaction

Schmid, R.; Buizza, A. (Pavia): Visual-Vestibular Interaction in Oculomotor Control:
A Model Interpretation of Pathological Situations ............... 217
Analysis in Normals and Labyrinthectomized Patients .......... 222
on Vestibular and Optokinetic Nystagmus and Unit Activity in the
Vestibular Nuclei ........................................ 226
Young, L. R.; Crites, T. A.; Oman, C M. (Cambridge, Mass.): Brief Weightlessness
and Tactile Cues Influence Visually Induced Roll ............... 230
Takahashi, M. (Tokyo); Uemura, T. (Fukuoka); Fujishiro, T. (Tokyo): Recovery
of Decreased Compensatory Eye Movements and Gaze Disturbances in Patients
with Unilateral Loss of Labyrinthine Function .................. 235
Barnes, G. R. (Farnborough): Modification of Nystagmus Suppression by Peripheral
Location and Strobe Rate of Head-Fixed Targets ............... 238

Contents VIII

Experimental and Clinical Aspects of Mnire's Disease and
Other Vestibular Disorders

and Clinical Studies on Epidural Drainage Surgery ........... 242
Blood Pressure and Plasma Norepinephrine in Diagnosis of Mnire's Disease ............... 245
Shea, J. J. (Memphis, Tenn.): Autoimmune Sensorineural Hearing Loss as an Aggravating
Factor in Mnire's Disease ............................. 254
Harada, Y. (Hiroshima): Ultrafine Structure of the Otoconial Membrane .... 258
Futaki, T.; Kawabata, I. (Tokyo): An Experimental Investigation of Streptomycin
Ototoxicity to the Otolith Organ by the Parallel Swing and Observation
of Otoconia through SEM in the Guinea Pig ................... 264
for the Cervical Vertigo .................................. 268
Krejcov, H.; Lesn, I.; Vackov, M.; Stracrov, B. (Prague): Vestibuloneurological
Findings in Children with Severe or Profound Loss of Hearing ..... 271
Schaefer, K.-P.; Suess, K.-J.; Friedrich, H. A. (Gttingen): Moving Sound
Sources and Their Clinical Applicability ...................... 274
Silvoniemi, P.; Aantaa, E. (Turku): Some Aspects of the So-Called ‘Vestibular
Neuronitis’ ........................................... 278
Bustamante-Balcarcel, A.; Barrios del Valle, R. (Mexico): Histopathological Temporal
Bone Findings in von Recklinghausen’s Disease. ............ 281

Ataxia

Dichgans, J.; Diener, H. C. (Tbingen); Mauritz, K. H. (Freiburg): What Distinguishes
the Different Kinds of Postural Ataxia in Patients with Cerebellar
Diseases ........................................... 285
Diener, H. C.; Dichgans, J.; Bootz, F. (Tbingen): Functional Plasticity of Spinal
and Supraspinal Reflexes in Maintaining Upright Stance ........ 288
Bchele, W; Brandt, T.; Degner, D. (Essen): Ataxia and Oscillopsia in Downbeat-Nystagmus
Vertigo Syndrome .................................... 291
Response of Medullary Reticulospinal Neurons to Natural Stimulation
of Labyrinth Receptors .................................. 298
Response of Medullary Reticulospinal Neurons to Sinusoidal Rotation
of the Neck ........................................... 302
Ohyama, H. (Ube City); Honjo, S. (Hikari); Sekitani, T.; Nishikawa, K.; Okinaka,
Y.; Matsuo, T. (Ube City): Evaluation of Ataxia with Square Drawing
Test Discussing Macrographism .......................... 306

Contents IX

C. (Matsumoto): Evaluation of Ataxia by Measuring Changes in Angulation
of Shoulders while Stepping .......................... 311
City): Influence of Head Tilting on Maintaining the Arms in the Horizontal
Position ............................................ 315

Neurophysiological and Clinical Aspects of
Vestibular Compensation

Precht, W. (Zrich): Panel Discussion Synthesis: Neurophysiological and Diagnostic
Aspects of Vestibular Compensation ....................... 319
Norr, M. E. (Leuven): Vestibular Compensation and the Significance of Rotation
Preface

The Brny Society is an interdisciplinary scientific panel founded in 1960 on the initiative of the late C.S. Hallpike and C.O. Nylen to the memory of Robert Brny, who was awarded the Nobel prize in 1917 for his outstanding research in the field of neuro-otology. The founders of the Brny Society aimed at increasing contacts between scientists in vestibular research because at that time relatively few basic scientists and clinicians took an interest in this particular field of neuroscience. Since the beginning of space exploration medical problems concerned with space and weightlessness and hence the interest in the physiology and pathophysiology of the vestibular system have become more and more important. Vestibular research is no longer a restricted area of otology, covered by experienced clinicians with a scientific interest in the function of the semicircular canals, but has become a part of the vast interdisciplinary field of central nervous system data processing.
research. In up-to-date vestibular research emphasis is laid on the vestibulo-ocular and the optokinetic reflex mechanisms, because 'rapid progress has been made in recent years toward understanding how the C.N.S. processes visual and vestibular signals to produce eye movements and body postural responses ... and a new literature on visual-vestibular interactions is beginning to build ... ' [Cohen, 1981]. This evolution demands and implies an increasing contribution from basic sciences. For these reasons topics such as visual correlates of full-field motion, natural retinal image motion, the influence of visual motion cues on postural control, input-output activity of the primate flocculus during visual-vestibular interaction, error signals subserving adaptive gain control in the primate vestibulo-ocular reflex have become fundamental problems which demand the cooperation of experts like the neurophysiologist, ophthalmologist, neurologist, psychologist and otologist. At present it is practically impossible to follow or digest the vast information produced in the laboratories of basic science institutions and of aeronautic as well as space medicine. This situation, however, implies the danger that the clinician is no longer informed about recent advances in vestibular research which are relevant to his understanding of clinical symptoms of a vestibular disorder. On the other hand, there is also a certain danger that basic research gradually follows its own line without having any concern with problems of clinical relevance, becoming more and more a scientific 'l'art pour l'art' activity.

Planning the 8th extraordinary meeting of the Brny Society in Basel, we had in mind to organize a symposium on 'neurophysiological and clinical aspects of vestibular disorders' because we wanted an interdisciplinary discussion not only between the representatives of various medical specialties but also principally between the open-minded scientist from the laboratory and the scientifically minded clinician. For these reasons main topics of general and mutual interest have been chosen and they were elucidated during the meeting both from a theoretical and clinical angle. The present volume is an attempt to give a state of the art review on some interdisciplinary topical problems in experimental and clinical vestibular research.

Basel, July 1982 C.R. Pfaltz

Acknowledgements
The committee of the Brny Society would like to thank the government and the University of Basel for taking over the official patronage of our symposium. Special thanks go to the management of Ciba-Geigy Ltd., Basel, for providing major support for the organization of this meeting.