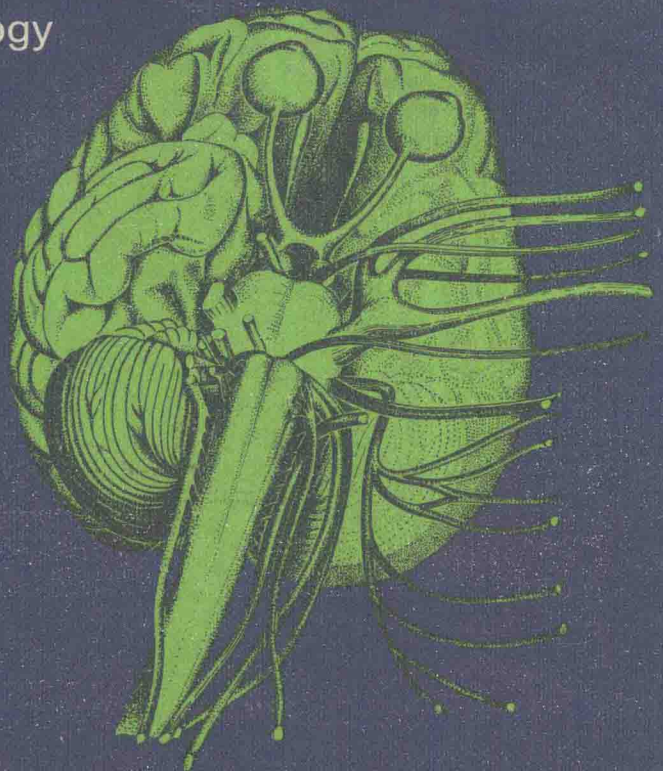


The Cranial Nerves

Edited by M. Samii and P.J. Jannetta

Anatomy
Pathology
Pathophysiology
Diagnosis
Treatment



Springer-Verlag Berlin Heidelberg New York

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With 410 Figures

Springer-Verlag Berlin Heidelberg New York 1981

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ISBN 3-540-10620-0 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-10620-0 Springer-Verlag New York Heidelberg Berlin

Library of Congress Cataloging in Publication Data. Main entry under title: The Cranial nerves. "Contributions . . . [to] the International Symposium on Cranial Nerves held in Hanover, Federal Republic of Germany, from June 2nd to June 6th, 1980" — Foreword. Bibliography: p. Includes index. I. Nerves, Cranial—Diseases—Congresses. 2. Nerves, Cranial—Congresses. I. Samii, Madjid. II. Jannetta, Peter J. III. International Symposium on Cranial Nerves (1980: Hannover, Germany) [DNLM: 1. Cranial nerves. WL 330 C891] RC410.C7 616.8 81-5617 ISBN 0-387-10620-0 AACR2

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Printed in Germany.

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Typesetting, printing and bookbinding: Konrad Triltsch, Graphischer Betrieb, D-8700 Würzburg.
2122/3130-543210



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Foreword

No special field of surgery dealing with the cranial nerves exists today. This is not surprising in view of the characteristics of this group of morphologically and topographically heterogenous nerves. Morphologically we must differentiate between central nerves (I, II and VIII) and the so-called peripheral nerves (nn. III to VII and IX to XII), in which post-lesion regeneration is quite different. Anatomico-topographically we must consider an intracranial and an extracranial part of each cranial nerve. For practical reasons at operation, further subdivisions of the intracranial course of cranial nerves are to be distinguished in the anterior, middle and posterior cranial fossae as well as within the petrous bone. This underscores the extensive tasks awaiting surgeons operating in the ventral part of the brain and facial skull as well as in the more dorsal part of the skull and neck. This very wide field cannot be covered by a single surgical discipline alone. In our opinion, considerable progress has been made in surgery of the cranial nerves only in recent years. This may be explained by the increased mastery of microsurgical techniques by all surgeons interested in the surgery of the base of the skull as well as with the initiation of more interdisciplinary consultation and jointly performed operations. Possibilities of future development can be discerned in the text. The base of the skull separating the extra- and intracranial part of cranial nerves should not be a barrier but a connecting link.

This symposium brought together specialists from various fields who exchanged their experience and views. We hope to encourage a multidisciplinary approach to our problems and to prepare the next step forward.

This volume, therefore, contains articles from various experts (anatomists, physiologists, neurophysiologists, neuropathologists, neurologists, neuroradiologists, neurosurgeons, earsurgeons, plastic and reconstructive surgeons) who have made substantial experimental and clinical contributions in this field. The text proves the effectiveness of such an interdisciplinary team with an exchange of ideas on the part of colleagues approaching the same problem from different angles. It contains, in a condensed form, the most essential information on the topic of cranial nerves. This is otherwise available only through articles which are widely scattered throughout various journals. This volume constitutes an unusual survey of surgery of cranial nerves which was not previously available. We take great pleasure in thanking the initiators, Doctor Madjid Samii and Doctor Peter J. Jannetta for their ideas and their excellent organization of this symposium. We should also like to thank the authors and Springer Verlag for their good cooperation which has enabled this volume to be presented in such a short time.

Preface

This volume consists of contributions by a large group of distinguished experts who participated in the International Symposium on Cranial Nerves held in Hannover, Federal Republic of Germany, from June 2nd to June 6th, 1980. During this symposium it became clear to us that major new concepts in our understanding of cranial nerves, anatomy, physiology and pathology have recently been described, and further, that these concepts were evolving in many areas by investigators of diverse and even disparate disciplines. It seemed reasonable in our many discussions concerning this symposium, being the only potential one there is at present, that a platform consisting of leaders in various disciplines could share their knowledge and ideas with each other and with an audience composed of well informed investigators and that the result of this exchange could be advantageous in many ways.

Perhaps the most important single point demonstrated in the volume is that the sharing of our present knowledge in a true interdisciplinary approach to problems in science and medicine, as evidenced in the particular problems of the cranial nerves, might provide a basis for sharing information in a way that would be beneficial to physicians and basic investigators working in these areas and of course to patients with the various, often disabling problems that interfere with their lives. Each section of the volume is organized around one, or a logically organized group of cranial nerves and contains contributions concerning the anatomy, physiology, pathology and clinical diagnoses and treatment of the clinical disorders in that nerve or group of nerves. A discussion concerning the major problems of that nerve or nerves is then included.

In these discussions, as well as in the primary contribution by each author, recent developments in our knowledge of cranial nerves function and malfunction are evaluated. Since all disciplines came together for purposes of evaluation, a synthesis could usually be evolved, composed of multiple view points upon the same problem, so that the current state in many areas improved. In addition to this information, the exploration of new possibilities for basic investigation, clinical research and new methods of treatment have been presented and discussed during the symposium and are interpreted here for the reader.

We feel that this volume will be useful to physicians and students who are working with patients with clinical cranial nerve problems and also those investigating the basic function of cranial nerves.

Hannover and Pittsburgh

M. SAMII and P. J. JANNETTA

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History of Cranial Nerves Surgery.

Introductory Lecture

F. LOEW, Homburg, Saar/FRG

One expects a real introduction to start with a historical review which leads from the earlier roots of knowledge of the topic in concern to the present situation, outlines the actual problems and finally gives some perspectives of future development. The earlier the historical starting point, the better an introduction.

To fulfill these requirements I travelled to Greece. You certainly remember that in prehistoric times neurosurgery started in this area and that the first major published neurosurgical operation was the delivery of the goddess Athena from the head of her godfather Zeus. Therefore I asked the delphic Sybilla whether she could give me some informations about the beginning of cranial nerve surgery. After appropriate opening of my mind by smoke and a lot of Greek wine, she told me that I was foolish to travel to Greece. I should have known myself that neurosurgery started with cranial nerve surgery, with other words, that cranial nerve surgery is the fundament of neurosurgery, a statement which clearly underlines the importance of this meeting. I needed some more rhezina, this strange but lovely resined wine, to understand the meaning of this very delphic information. Zeus, when pregnant with his daughter Athena in his forehead, suffered from a neuralgia of the first trigeminal branch, surely a symptomatic trigeminal neuralgia, and was cured by removal of the tumor-like girl.

The differentiation between idiopathic and symptomatic trigeminal neuralgia had been unknown in those prehistoric days and is an invention mainly of our last century. You will learn during this symposium, that we are going to return to the wisdom of old Greek goddesses and doctors and to abandon the idea of essential or idiopathic trigeminal neuralgia, detecting more and more real and treatable causes of seemingly idiopathic neuralgias. One of the pioneers in this field, Dr. Jannetta, is present at this course as one of its initiators and lecturers.

Also in more recent times surgical procedures for cranial nerve diseases and symptoms belong to the beginning of modern neurosurgery. The first major operations for *relief of optic nerve compression* by transcranial subfrontal or subtemporal approach were done as early as 1889 by Horsley, followed by Krause (1900), Kiliani (1904), Schloffer (1907), Halstead (1909), only to mention some pioneers in neurosurgery.

The first *intracranial operation for treatment of trigeminal neuralgia* was performed by Horsley in 1891, unfortunately with fatal outcome. It was Fedor Krause who in 1892 successfully sectioned the second and third branch of the trigeminal nerve by an intracranial approach and in 1893 removed the trigeminal ganglion in order to treat trigeminal neuralgia.

The next important steps were:

- the retrogasserian section of the trigeminal root, using a subtemporal approach, first published in 1901 by Spiller and Frazier,

- puncture and alcohol injection into the gasserian ganglion by Härtel in 1913,
- subtentorial approach and trigeminal root section by Dandy (1925),
- electrocoagulation of the trigeminal ganglion (Kirschner 1933),
- Sjöqvist's procedure of transection of the descending spinal trigeminal tract (1937)
- and attempts to cure trigeminal neuralgia without neurological deficit by decompression procedures (Taarnhøj 1952, Stender 1953).

The last steps towards optimal treatment of trigeminal neuralgia have been the thermocontrolled selective trigeminal rhizotomy in the modification of Sweet, which tries to mainly destroy the poorly myelinated fibers for pain and thus to preserve the other functions of the trigeminal nerve, and the search for vessel loops and other mechanical factors which irritate the trigeminal root thus producing seemingly idiopathic trigeminal neuralgia, in order to treat the very causes of this disease without any function loss. Dandy was the first to perform this last mentioned way which nowadays is mainly propagated by Jannetta.

The long history of neurosurgical attempts to treat trigeminal neuralgia clearly shows two main tendencies:

- to improve our knowledge about the reasons of cranial nerve diseases in order to find causative treatment possibilities,
- or to treat the symptoms with a minimum of neurological deficit.
- Both trends are to be followed also in diseases of other cranial nerves.

Before leaving the trigeminal nerve I have to mention that neurosurgeons not only and always try to destroy this nerve but, in some special situations, to restore its function. To the best of my knowledge it was Samii, initiator, organizer and host of this course, who first described the reinnervation of the important first trigeminal branch by nerve graft.

Similar to the optic and trigeminal nerves also *lesions of the VIIth and VIIIth nerves* have been in the center of neurosurgical attention. The acoustic-vestibular nerve has the unfortunate tendency to produce neurinomas. The removal of these neurinomas confronted neurosurgeons with the problems of preserving the facial nerve or to restore its function when preservation failed. Improvement of operative technique improved not only the results of *acoustic neurinoma removal* regarding mortality and morbidity but also with regard to facial nerve preservation. The present state of operative technique recently has been described by Yaşargil (1977).

For *restoration of facial nerve function or compensation of its loss*, had the preservation of this nerve not been possible, four main ways have been used:

- plastic surgical methods for restoration of facial symmetry,
- anastomoses of the facial nerve with other nerves, mainly with the accessory, hypoglossal or phrenic nerves (for literature see Loew and Kivelitz 1973),
- anastomosis with the healthy facial nerve of the other side (Samii 1976, 1980),
- intracranial suture of the facial nerve or bridging or bypassing a facial nerve defect using a nerve graft. Prototype and starting point of this last mentioned possibility has been the Dott procedure (Dott 1958). Charles Drake as well as I myself tried the method of Norman Dott in the early 1960's – like Dott without having a microscope – with remarkable good results.