Springer-Verlag Berlin Heidelberg GmbH

André Leblanc

Encephalo-Peripheral Nervous System

Vascularisation Anatomy Imaging

Forewords by J. P. Francke, P. Lasjaunias, and Y. Guerrier

With 349 Figures in 923 Separate Illustrations, Mostly in Color

Springer

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Title of the original French edition: *Système Nerveux Encéphalo-Périphérique*

Softcover Edition
ISBN 978-3-540-20810-5 ISBN 978-3-642-56435-2 (eBook)
DOI 10.1007/978-3-642-56435-2

Library of Congress Cataloging-in-Publication Data
Leblanc, André, 1934- [Système nerveux encéphalo-périphérique. English] Encephalo-peripheral nervous system: vascularisation, anatomy, imaging / André Leblanc ; forewords by J.P. Francke, P. Lasjaunias, and Y. Guerrier. p. ; cm. Includes bibliographical references and index.

1. Nerves, Cranial-Atlases. 2. Brain-Blood-vessels-Atlases. I. Title. [DNLM: 1. Cranial Nerves-anatomy & histology-Atlases. 2. Cranial Nerves-blood supply-Atlases. 3. Cranial Nerves-radiography-Atlases. WL 17 L445e 2001] QM471 .L4313 2001 611'.83-dc21 00-059510

Originally published by Springer-Verlag Berlin Heidelberg New York in 2004.

English translation: Licia Huffmann-Touzet, Pont à Marcq, France
Cover design: Erich Kirchner, Heidelberg
Composition and photoengraving: Vervaeke S.A.Numérique, Roubaix, France
Printed on acid free paper 21/3150/op 5 4 3 2 1 0

Foreword

Twenty-five years have gone by since André Leblanc first walked into the department to present his manuscript on the determination of the axes of the various foramina, canals, and sulci of the base of the skull, and on their tomographic investigation, to my master, Professor Claude Libersa. The project was deeply modified and further enhanced by coupling classical anatomy with the exploding new imaging techniques.

Only a curious, meticulous, inventive, and tireless worker like André Leblanc could make this project a success. Thanks to his determination, he mobilized some of the best radiologists, clinicians, editors, and even anatomists, and urged each one of them on toward excellence. I admit that at times, it was a bother, but we have forgiven him for the sake of his rigorous demonstration and admirable results.

André Leblanc's volume entitled "The Cranial Nerves", which was first published in French in 1989, and later in English, soon became the definitive reference book for all those who deal with the cranial nerves, whether on a regular basis or occasionally. Thus, a new updated edition was published both in French and in English in 1995, and now a new title, more complete yet, has been born.

While others would have savored their success, André Leblanc never ceased working, running from one congress to the next, charming everybody from Chicago to Singapore to Taiwan... Not a month goes by without one of André Leblanc's new posters, more educational than ever, being added to the others on the walls of radiology practices, MRI centers, otolaryngologists and other head specialists.

The book we present today, entitled "Encephalo-Peripheral Nervous System", is a model of its kind in terms of rigor, knowledge, and esthetics. The new perspectives that it offers will help each and every one of us to get a better grasp of the anatomy of the nervous system and identify the many elements that compose it.

We extend our deepest thanks to André Leblanc, for he is a wonderful pedagogue, and an heir, as Pierre Lasjaunias once said, to the French clinical and anatomic tradition. His many publications open a remarkable window onto the fields of anatomy and imaging. As Yves Guerrier stated without hesitation, here is a scientist whose reputation has reached far beyond our borders.

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Foreword

André Leblanc's book entitled "Anatomy and Imaging of the Cranial Nerves", published in 1989, and its second edition published in 1995, were immensely successful on an international scale. He has just completed a still more thorough book entitled "Encephalo-Peripheral Nervous System". The first two publications were the successful conclusion of long, tedious and unrelenting work carried out with a meticulousness that did credit to its author. André Leblanc is without contest an heir to the French anatomic and clinical tradition. He has successfully combined dissections, cross sections, and views of the skull with functional anatomic data on the cranial nerves, standard radiographs and magnetic resonance imaging. In this sense he has also contributed to the anatomic and radiologic tradition with his work, a compilation which features architectural ideas and a rigorous selection in terms of both information and images. In short, he has become a model for the French school. He did not seek to make strict correlations, but managed to associate views in the same plane with general views of the cranial nerves, thereby combining 2D, 3D and diagrams. His capacity to link detailed vision with overall views is rare nowadays and certainly deserves highlighting: it is modern, yet true to our tradition.

The first edition of "Anatomy and Imaging of the Cranial Nerves" and the posters which accompanied it were a showcase for the French school. André Leblanc's book can now be found all over the world, and his posters hang in most general radiology and neuroradiology departments. The wide recognition is a source of pride for him and us alike, and surely an encouragement to read this work in a little more detail. The distribution and recognition outside our borders of a man whom our system might classify as marginal should prompt reflection on the part of those responsible for the system: does progress not always begin with a marginal phenomenon?

Finally, André Leblanc's multidisciplinary approach and the addition of blood vessels in this new work illustrate the extent to which the anatomic foundations of imaging are an essential accompaniment to the development of therapeutic techniques. Indeed, several years after the creation of groups for neurosurgery of the skull base and the introduction of minimally invasive or endovascular approaches, the knowledge of the anatomy of the cranial nerves has not only improved clinical precision, it has also become a series of significant landmarks and a surgical challenge.

Just a few years ago, syndromes of the skull base were still considered obstacles or contraindications for treatment. Today surgeons' knowledge of the anatomy of the nerves and ability to spare them during treatment are an index of their surgical skill and precision. Functional rehabilitation and immediate reconstruction are the aspects most recently focused on.

"Encephalo-Peripheral Nervous System" is therefore a reference not only for clinicians, surgeons and neuroradiologists, but also for anatomists. It is a successful balance between scholarly detail and clinical practice. Working with a book like this is sheer pleasure: it provides authentic teaching material for pedagogues, and will be pleasantly easy to use for students or others who have the privilege to become acquainted with it.

I am proud to have been involved in the project from its very beginning and to see the author's persistence rewarded.

Professor Pierre Lasjaunias
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Foreword

Here is another anatomic farandole on the investigation of the "Encephalo-Peripheral Nervous System" played for us by André Leblanc.

It is the fruit of many long years of studying the skull's anatomy, the audiovestibular system, and the face, and the result of his close and long-lasting acquaintance with radiology and otolaryngology.

André Leblanc is a highly talented illustrator of anatomy. He ranks among the most famous illustrators of morphological textbooks published in the last few years.

The abstractive quality of his book can be seen in the high-precision diagrams that illustrate the traditional iconography. As usual, we are in awe when he presents a monograph in which beauty and accuracy are intricately intertwined.

Though the wonder reappears with each new page, reassured clinicians may find the detail sought for, for the book is also an excellent practical guide.

Concerning the audiovestibular organs, nothing can be more abstract, as are the perilymphatic spaces that he represented with talent and precision. For those of us who already know, and even more so for those who are learning, these structures are very elaborate, and have been called, rightly so, the labyrinth.

Those who should know the constitution of the ear often did not take time to look into it because, they said, it was too complex and too tedious. They will no longer be able to say that: the beauty and precision of André Leblanc's drawings make the study of anatomy pleasant.

I would have liked to work with him, much as an author likes to write for a gifted musician.

Yves Guerrier
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Preface and Acknowledgements

This new publication entitled "Encephalo-Peripheral Nervous System" is a simple, yet original approach to anatomic investigation and imaging. When used as a guide, most of the vulnerable parts of nerves can be quickly visualized, regardless of their position. The courses of nerves are studied by means of standard anatomic dissections and macroscopic cross sections, and by imaging techniques.

This volume adds substantial information to the second edition of my atlas entitled "The Cranial Nerves" (1995). Many preliminary explorations on dry bone and dissections were necessary to develop it. In contrast, imaging in a multitude of planes seems effortless, thanks to the angles that I have defined and tried on many morphologically very different patients over the years. These reference angles enable the investigator to determine the precise axis of an orifice or to view the course of a nerve.

They can be used regardless of the morphology or the state of the patient, and take possible asymmetries into account.

The benefits of this book lie not only in the association of anatomy with modern imaging techniques (CT and MRI), but also and predominantly in the numerous diagrams that systematize the courses of nerves: MR and CT views are correlated to anatomic views, cross sections and diagrams to depict the nerve's encephalic origin (nuclei), its apparent origin, and anastomotic branches. Arteries and veins are included in the descriptions.

It is a fact that clinicians and radiologists need extremely detailed anatomic references. This work will be a precious guide for them in the areas of anatomy and imaging techniques.

Constant progress in new imaging techniques has broadened the possibilities of oblique planes and three-dimensional reconstruction. This new "method" can thus easily be adapted to modern technologies, although reading the images may prove more delicate.

Our hopes are that this book may be a channel to renew interest in this part of the body thanks to the progress in tomography and magnetic resonance imaging. The quality of spatial resolution now makes it possible to visualize the meanders in the canal and the intracranial courses of nerves.

This book is the fruit of 40 years of work and research, during which I was assisted by the Institute of Anatomy of the Faculty of Medicine in Lille, and in particular by Professor Jean Paul Francke, whom I wish to thank for the anatomic sections and dissections that he has faithfully carried out since 1980 every time a chapter required this type of illustration. I also wish to thank neurosurgeons Professors Chun Siang Chen, Chandranaht Sen and Kalmon D. Post, of the Department of Neurosurgery at the Mount Sinai Medical Center, New York, USA, who permitted me to use some of the exceptional illustrations from their scientific works, making my book even more interesting.

I would also like to thank Michel Herbaut, photoengraver at Vervaeke's, Roubaix, who, since 1987, has printed all my posters and done the typesetting for both the French and English versions of this book.

I wish to once again dedicate this book to Professor Claude Libersa. By his presence and expertise, he gave me the means to pursue my study of an arduous discipline when others did not attribute much credit to this work.

Thanks to his generous support and his determination, the many posters illustrating the course and blood vessels of the cranial nerves, as well as the first two editions of the atlas dedicated to the cranial nerves, were able to be completed and published, and thus satisfy the needs of medicine and modern science.

This new title exists because of him, and I wish to express my gratefulness to him.

André Leblanc

To Jeanne, my beloved wife,
for her help over the years,
for upholding me morally and physically,
for being so generous in those difficult times.
Without her, my work would have remained unfinished.

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Important Notice

Before reaching the muscles they supply, the cranial nerves course through a number of foramina, canals, and sulci. Each one of these orifices has a very specific axis, and it is along this axis that images should be made.

Traumatism on the skull can cause a number of pathologies ranging from anesthesia to paralysis. They may result from hematomas due to a fracture, or tumoral lesions which compress the canal containing the nerve.

Each structure through which the cranial nerves pass has its vulnerable points. Therefore great care should be taken to explore each channel along its own axis, for fear of deforming the image and thus, making the wrong diagnosis (see page 23).

A few years back, imaging relied heavily upon conventional radiography and mainly provided views of the bones. When exploring cranial-nerve-related pathologies, radiologic investigation was limited to viewing the bony orifice of interest, exactly along its axis, based on two reference lines. These reference lines were constant, regardless of the morphology and the state of the patient, and took possible asymmetries into account.

Thus, conventional X-ray investigations required a very detailed knowledge of anatomy. Unfortunately, modern imaging techniques have contributed to the decline of anatomy as a discipline.

Computed tomography and magnetic resonance imaging have become the privileged instruments of intracranial explorations, for they provide the likes of an anatomic section. Nevertheless, CT and MRI views are rarely taken along the axis of the ostia and canals. Although the images are three-dimensional, and because most channels are extremely sinuous, the operator can fail to notice a small fracture, a hematoma, or a minute lesion compressing a nerve if proper orientation of the views is not respected.

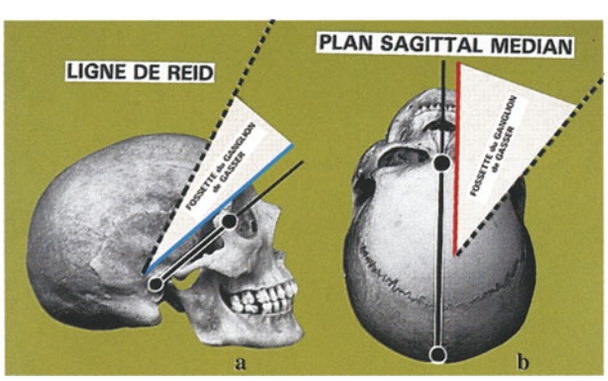
Reliable views can be obtained by following the conventional technique based on centering and anatomic references. This is also possible with CT and MRI, thanks to the broad possibilities of orientation and three-dimensional reconstruction.

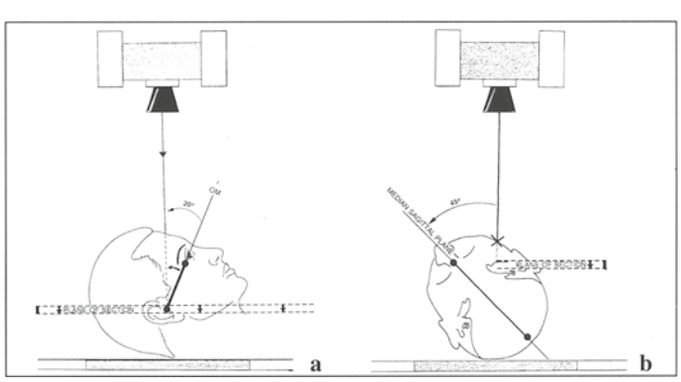
Thus, the conventional method can easily be adapted to modern imaging. Interpretation is rendered more delicate, it is true. But clinicians and radiologists must refer to detailed anatomic information.

That is why the author continues to present the descriptions and diagrams, which he has adapted to modern imaging techniques, of conventional reference angles in the present volume.

André Leblanc

The author developed and used centering and reference angles for bony orifices of the skull over many years. These required many preliminary explorations and dissections on dry bone and adjustments on morphologically very different patients. These reference angles let the investigator view the precise axis of every orifice transmitting nerves and blood vessels, from their very origin to the end of their course in the skull, and thus provide visual access to the areas of compression (due to hematomas in fractures, or tumors such as neurinomas, regardless of their size). The angles take possible asymmetries into account.





Two reference planes have been defined for each bony orifice or canal:
a) **orbital meatal plane** (Reid's line): blue line along the edge of angle
b) **median sagittal plane**: red line on the edge of a cardboard angle
Broken lines indicate the axis of the orifice to investigate

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