In this unique book, Sir Donald Harrison draws on his wide-ranging experience as a surgeon and comparative anatomist to produce an authoritative and detailed account of the anatomy and physiology of the mammalian larynx. His investigation of the larynx has involved the study of over 1400 specimens of mammalian larynges from around the world, as well as using data from his own clinical experiences. The comparative morphology of the larynx is discussed from a developmental and functional perspective, and the involvement of the larynx in respiration, locomotion and vocalization is highlighted. Throughout the book the relationship of structure to function is drawn out, and the clinical relevance of features of the human larynx is emphasized.

This book will be an invaluable reference for all researchers and clinicians involved in laryngology, as well as for anatomists, zoologists and anaesthesiologists.

The Anatomy and Physiology of the Mammalian Larynx

The Anatomy and Physiology of the Mammalian Larynx

D F N HARRISON
University of London

CAMBRIDGE UNIVERSITY PRESS

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

First published 1995

Printed in Great Britain at the University Press, Cambridge

A catalogue record for this book is available from the British Library

Library of Congress cataloguing in publication data

Harrison, D. F. N. (Donald Frederick Norris)
The anatomy and physiology of the mammalion larynx/D. F. N. Harrison.
p. cm.
Includes index.
ISBN 0-521-45321-6 (hardback)
1. Larynx–Anatomy. 2. Larynx–Physiology. 3. Anatomy, Comparative. I. Title.
[DNLM: 1. Larynx–anatomy & histology. 2. Larynx–physiology. 3. Mammals. 4. Anatomy, Comparative. 5. Physiology, Comparative. WV 501 H318a 1995]
QM331.H37 1995
599'.012–dc20
DNLM/DLC
for Library of Congress 95–742 CIP

ISBN 0 521 45321 6 hardback

RO

Dedicated to my wife Audrey,

who has understood and accepted my determination to combine a surgical career with that of an amateur comparative anatomist. Without her support and tolerance this book would never have been completed.

Contents

Preface

In 1929 Victor Negus, a Junior Surgeon for Diseases of the Throat and Nose, Kings College Hospital, London, published a book entitled *The Mechanism of the Larynx*. Part of this was based on his research for a Degree of Master of Surgery in the University of London. However, this 528 page volume contained unique observations on the comparative morphology of a wide range of animal larynges, cumulating in a fundamental account of the origin, development and mechanism of this unique organ.

Early in my own laryngological career, I had read and marvelled at the erudition of this 'amateur comparative anatomist', ultimately hoping to extend his research by utilizing modern techniques and a wider range of animals. As Professor of Laryngology and Otology at the Institute of Laryngology and Otology in London, I had developed a laboratory for sectioning human larynges removed for cancer. This was for an investigation into the manner by which neoplasia spreads through this organ. On completion of this research in 1976, these facilities became available for detailed examination of other mammalian larynges. Specimens were collected over the following 17 years from zoological institutions, game parks and helpful friends throughout the world. Most, however, came from post-mortems carried out in the Pathology Department of the Zoological Society of London. Without the enormous support and good will of this institution and many other helpful people, this unique collection of mammalian larynges would have been impossible; my gratitude is infinite.

With over 1400 specimens and 100 cot death larynges, the preparation and processing of all this material required the skilled and enthusiastic support of a small number of dedicated individuals. Most of the sectioning was carried out by Mrs Christine Brock, whose technical expertise with rare and unusual materials is unsurpassed. Several medical students working for their BSc in Anatomy, or just interested in comparative anatomy joined in, Jonathan Blaxhill and Anna Crown (now Dr Staricoff) being especially notable. Foremost, however, was my elder daughter Susan Denny. A zoological graduate, she has been responsible for the major part of the data collection, illustrations, museum preparations and

numerous other tasks, which my occupation with the problems of head and neck cancer prevented my undertaking. At night I assembled all this material, examined slides, made notes and then transferred the data to custom designed punch cards. Eventually, having taught myself some skill in the use of spread sheets, data bases and statistical analysis, everything was stored on a hard disc, awaiting the day when I could devote enough time to digest this information. Retirement meant cessation of surgery but not a great deal of spare time; although now I could begin to collect my thoughts and generate a plan for the compilation of the book I had wanted for several years to write.

Cambridge University Press agreed to undertake the printing of a book whose subject might well have been considered as 'unfashionable'; for comparative anatomy even when related to a clinically important organ, is not as popular today as in the past. For their support and encouragement I remain eternally grateful. My successor at the Institute, Tony Wright, generously provided space for the extensive collection of slides, museum pots and fixed specimens. The Department of Clinical Photography at this institution were responsible for all the illustrations and again, I am most appreciative of their unrivalled expertise. A valued colleague and friend Robert Pracy, MPhil., agreed to read the draft manuscript to 'tidy up' the grammar and punctuation. Any residual errors, however, are solely due to my ignoring his wise council!

Despite considerable experience in medical writing, the compilation of a more scientifically orientated book proved surprisingly difficult, although a great deal more interesting. Much new data had to be digested, analysed and then correlated with existing knowledge of the anatomy and physiology of the mammalian larynx. This, however, highlighted considerable gaps existing in our knowledge of the fundamental processes that govern laryngeal function. Morphological studies, whilst providing valuable three-dimensional information, emphasize the variance that occurs within species and between individual orders. Unfortunately, any extension of similar studies, designed to include larger numbers of more unusual or exotic species, remains unlikely because of the scarcity of funds and the difficulty of obtaining specimens in a changing environment. With these limitations this work, although by a self-confessed 'amateur' anatomist, will probably remain as a unique investigation into the structure and function of one of Mammalia's most fascinating organs. Hopefully, it will be of interest to many disciplines, and at the same time stimulate an increased interest in comparative morphology.

D. F. N. H.