A SYNOPSIS OF OTORHINOLARYNGOLOGY

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With a section on

NEUROLOGY OF THE EAR, NOSE, AND THROAT

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To the memory of
JOSEPH TOYNBEE
who, in 1857, was appointed Aural Surgeon to
St. Mary's Hospital, the first general hospital to
set aside beds for diseases of the ear and to institute
the teaching of this subject.

PREFACE

We hope that this book will prove to be a useful addition to the "Synopsis" series. It is intended for quick reference and revision, especially by those who are studying for postgraduate examinations in the specialty.

Much material has inevitably been drawn from the current standard text-books and journals dealing with the subject. In this respect we wish particularly to acknowledge the liberal help we have obtained from the book by the late Sir StClair Thomson and Sir Victor Negus, and from those edited by Mr. Maxwell Ellis, Mr. W. G. Scott-Brown, and Mr. F. W. Watkyn-Thomas. Many other sources have been consulted, including original articles in the *Journal of Laryngology and Otology*, the *Archives of Otolaryngology* of the American Medical Association, and the *Annals of Otology, Rhinology and Laryngology*.

The principles of operative procedures are stated but the details of technique are not considered to lie within the compass of such a book. So rapidly have chemotherapy and the antibiotics developed in the past few years that we have thought it wise, in many instances, to use a generic term—Systemic Disinfection—when such drugs are indicated.

We feel that the association between neurology and diseases of the ear, nose, and throat deserves special attention, and for this reason a section on the subject has been incorporated. We thank Dr. Charles Harold Edwards for his valued collaboration in writing this section. Conversely, we have reduced the chapters on the trachea and bronchi to a minimum, as this subject is being increasingly absorbed by the rapidly-expanding specialty of Thoracic Surgery.

We are much indebted to Mrs. Murray Laing, who has produced many of the illustrations and whose skill and advice in this respect have been much appreciated. Mr. John Groves, Senior Registrar to the Ear, Nose, and Throat Department of St. Mary's Hospital, has rendered great assistance by reading the early drafts, and we have gladly taken advantage of his many pertinent criticisms and suggestions. He has also drawn a considerable number of the illustrations. He has our most sincere thanks.

We wish to thank Mr. Henry J. Shaw, Assistant Director to the Professional Unit at the Institute of Laryngology and Otology, London, W.C.1, for cheerfully undertaking the labour of correcting the final proofs.

Finally, we should like to record the friendly co-operation and help that we have received from Mr. L. G. Owens, B.Sc., Director of the firm of John Wright & Sons Ltd., throughout the preparation of this volume.

J. F. S.
I. G. R.
J. C. B.

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PART I

THE EAR

A SYNOPSIS OF OTORHINOLARYNGOLOGY

Section I.—SURGICAL ANATOMY

CHAPTER I

DEVELOPMENT OF THE EAR

Visceral Arches and Clefts.—During the early stages of fœtal development, a series of six *visceral arches* appears on the lateral aspect of the head. These mesenchymal arches form ridges in the overlying ectoderm and corresponding projections in the entoderm of the pharynx. The ridges become separated from one another by a series of furrows where ectoderm and entoderm come into contact with one another. The ectodermal furrows form the *visceral clefts*. The entodermal furrows form the *pharyngeal pouches* (*Fig.* 1).

AURICLE.—Develops from a series of six tubercles which form round the margins of the first visceral cleft.

EXTERNAL AUDITORY CANAL.—Is formed from the ectoderm of the first visceral cleft.

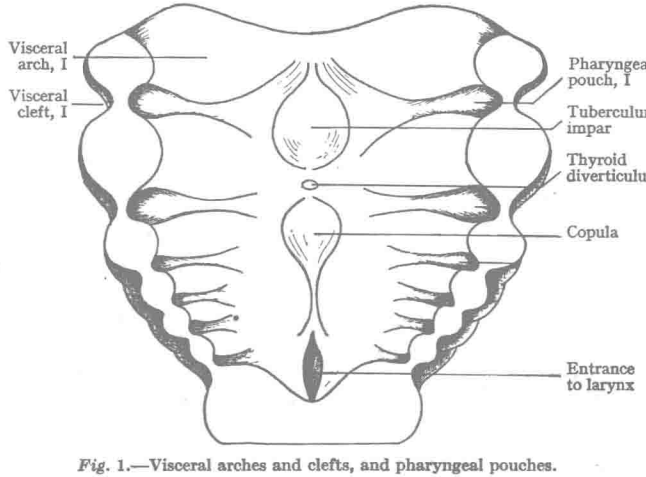

Fig. 1.—Visceral arches and clefts, and pharyngeal pouches.

Visceral Arches and Clefts, *continued.*

TYMPANIC MEMBRANE.—Has three layers :—

1. An outer *epithelial* layer, from the ectoderm of the first visceral cleft.
2. A middle *fibrous* layer, from the mesoderm between the first visceral cleft and the tubo-tympanic recess.
3. An inner '*mucosal*' layer, from a part of the recess (entodermal).

EUSTACHIAN TUBE AND TYMPANIC CAVITY.—Are developed from the entoderm of the *tubo-tympanic recess*, between the first and second visceral arches. The second pouch also plays a part.

MALLEUS AND INCUS.—Are derived from the mesoderm of the first visceral arch.

STAPES.—Is derived from the mesoderm of the second visceral arch.

INNER EAR.—Is developed from ectoderm in the region of the hindbrain. The ectoderm invaginates to form an *auditory pit*, which is later converted into an *auditory vesicle* (*Fig.* 2). The

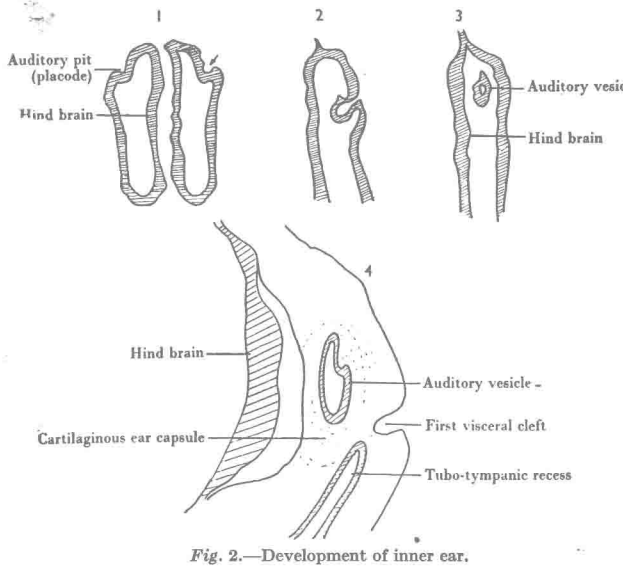

Fig. 2.—Development of inner ear.

membranous labyrinth is formed from the vesicle. The mesoderm surrounding it becomes the *cartilaginous ear capsule*, which finally ossifies to form the *bony labyrinth*. The tubo-tympanic recess lies at first on the inferolateral aspect of the cartilaginous ear capsule, but as the capsule enlarges the recess comes to lie

anterolaterally. A cartilaginous process grows out from the lateral part of the capsule to form the *tegmen tympani*. This process grows downwards to form the lateral wall of the Eustachian tube. In this way the tympanic cavity and proximal part of the tube are included in the petrous temporal bone. During the sixth or seventh month the mastoid antrum appears as a dorsal expansion of the middle ear cavity.

CHAPTER II

DEVELOPMENT OF THE TEMPORAL BONE

Morphological Elements.—There are four distinct elements which become fused together (*Fig.* 3).

1. TYMPANIC RING.—Is formed in membrane and is an incomplete circle deficient above. Its concavity is grooved by the *tympanic sulcus* for the attachment of the greater part of the circumference of the tympanic membrane. This circumference is thickened into a definite rim which allows the surgeon to dislocate the membrane out of the sulcus without tearing. The

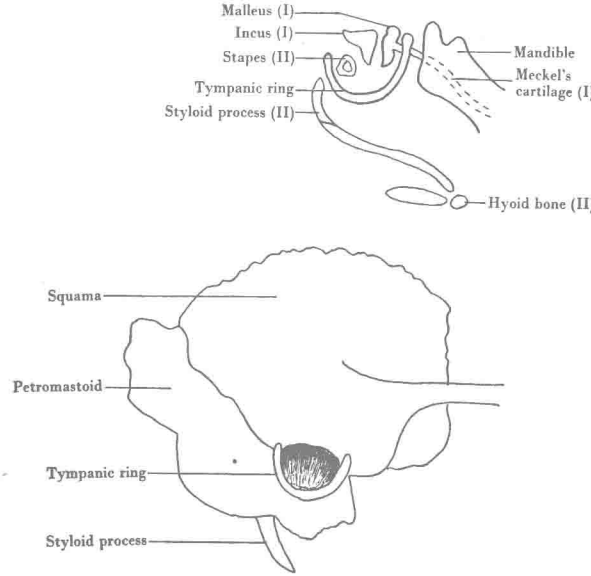

Fig. 3.—Morphological elements of temporal bone. (*Top, right*: Derivatives of the branchial arches.)

Morphological Elements—Tympanic Ring, *continued.*

ring grows laterally and slightly backwards to form the tympanic plate, but the anterior and posterior portions grow more rapidly than the rest. This leaves a foramen in the floor of the canal (the foramen of Huschke). This may persist through life.

2. SQUAMA.—Is also ossified in membrane and is developed to help in the protection of the brain. The postero-inferior portion of the squama grows downwards behind the tympanic ring to form the lateral wall of the mastoid antrum.
3. STYLOID PROCESS.—Is developed from the cranial end of the cartilage of the second visceral arch.
4. PETROMASTOID.—Is preformed in cartilage as a protecting capsule for the membranous labyrinth.

The bony capsule has three layers :—

a. A thin outer or *periosteal* layer.
b. A thick middle or *enchondral* layer.
c. A thin inner or *endosteal* layer.

Ossification may be defective in the middle layer, particularly in the region of the *fissula ante fenestram.* This is at the junction of cochlea and vestibule, just in front of the oval window, and is the site of election for a focus of otosclerotic bone.

Development of Mastoid Process.—The mastoid portion of the temporal bone is at first flat and the stylomastoid foramen, through which the *facial nerve* emerges, lies immediately behind the tympanic ring. As air-cells develop, the lateral part of mastoid portion grows downwards and forwards to form the *mastoid process.* Hence the stylomastoid foramen comes to lie on the under-surface of the bone. This descent is accompanied by an increase in length of the facial nerve canal. The mastoid process does not form a definite elevation until the end of the second year of life. The mastoid antrum lies *above* the tympanic cavity in the infant, about 2 mm. deep to the bony surface.

Mastoid Types.—There are three types of definitive mastoid process (*Fig.* 4).

1. *Cellular,* where air-cells are large and numerous.
2. *Diploic,* where cells are small and less numerous. Marrow spaces are present.
3. *Acellular* (or 'ivory'), where cells and marrow-spaces are absent.

Pneumatization of Mastoid.—80 per cent of mastoids are pneumatized, 20 per cent diploic or acellular. The pneumatized mastoid can therefore be regarded as normal. The individual type is usually the same on both sides.

Theories of Deficient Pneumatization.—There are three main theories :—

1. WITTMAACK.—Believed that the dense mastoid resulted from infantile otitis media, which interfered with the normal absorption of diploë and hence with pneumatization.
2. TUMARKIN.—Believes that 'frustration of pneumatization' results from failure of aeration of the middle ear cleft, from