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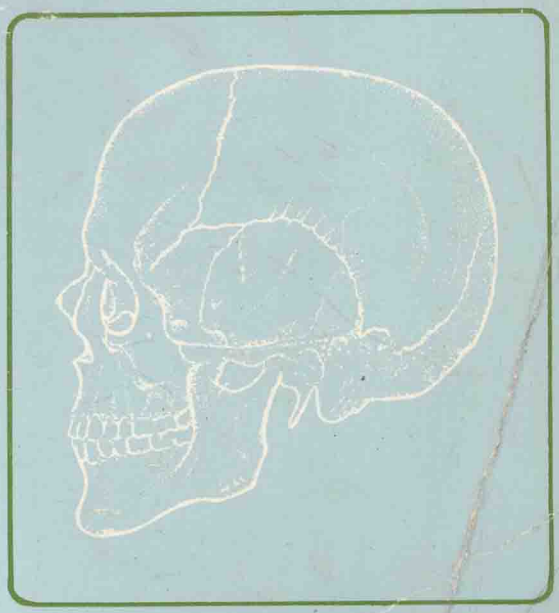
a programed instruction in clinical anatomy for dental professionals



BASIC STRUCTURES of the HEAD and NECK

a programed instruction in clinical anatomy for dental professionals

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PREFACE

This programed instruction textbook offers a unique presentation of the anatomy of the head and neck—one designed specifically for the requirements of persons engaged in the dental professions: students, practitioners, and teachers. The content is geared to both theoretical and clinical aspects.

Students find it difficult to sift out the general coverage of the anatomy of the head from extremely advanced textbooks. On the other hand, adequate treatment of minute details of specific areas of the head is hard to find in a single introductory manual. Attempted spot reading, especially of advanced texts, is laborious and time consuming. Here students of dentistry will find in one place a coverage which is both sufficient and as simple as the complexity of the subject will permit.

Practicing dental clinicians who feel a need for a quick reference, but whose time is limited, can select quickly the area of review desired without the need for going through the whole book or engaging in lengthy searches.

Professors in dental and allied health schools may wish to make use of this program as a classroom assignment, with stated goals set for regular progression from one unit to the next within a fixed time sequence. Others may wish to utilize the program more flexibly as a supplement to classroom instruction. Still other teachers may find it helpful to use parts or all of the program as the basic material for classroom lecture and discussion in the area of head and neck anatomy.

This program presupposes that the student will have completed a course in general anatomy of the human body. As a more advanced text, this book is intended to supplement approximately 25 hours of class instruction related directly to clinical orientation.

The program is organized into four parts: Anatomical Landmarks, Systems, Regions, and Clinical Applications. Part One presents an introductory examination of surface features, followed by a detailed look at the bones and foramina of the skull. These first two units establish points of reference for locating structures of the various systems. Part Two treats, in turn, the muscular, nervous, and vascular systems of the head and neck. Included in Part Two is some detail about the trigeminal, facial, glossopharyngeal, and vagus nerves because of the special importance of these four cranial nerves in dentistry. Part Three addresses itself to different regions of the head and neck in order to clarify spatial relationships among the structures of the various systems. The regions investigated in Part Three include the temporal and infratemporal fossae, the mouth, the nose and paranasal sinuses, and the pharynx and larynx. The culmination of the program is Part Four, which correlates anatomical topography with two important clinical applications, the spread of dental infection and the sites of dental injections.

The principal reference source for material in Units One through Sixteen is Russell T. Woodburne's *Essentials of Human Anatomy,* 4th Edition, New York, Oxford University Press. The two main sources consulted in the writing of Units Seventeen and Eighteen were *Oral Anatomy,* by Harry Sicher and E. Lloyd DuBrul, 5th Edition, Saint Louis, C. V. Mosby Company; and, *Manual of Local Anesthesia in General Dentistry,* published by Cook-Waite Laboratories, Inc., New York. The authors are particularly grateful for permission to copy illustrations contained in these three publications.

The behavioral objectives the student can expect to achieve upon completion of this program include the ability to describe:

(1) the superficial structures of the head and face,
(2) the principal bones of the skull, points of muscle attachment, foramina, and related vessels and nerves,
(3) the action, innervation, and blood supply of the muscles of facial expression and the muscles of mastication;
(4) the structures and actions related to the temporomandibular joint,
(5) the major superficial landmarks and blood supply of the brain,
(6) the location and function of the cranial nerves and their sensory and motor innervation,
(7) the major branches of the trigeminal, facial, glossopharyngeal, and vagus nerves, and the functional components of each,
(8) the branches of the external carotid artery and the structures of the head and neck which they supply,
(9) the structures in the oral cavity, relating surface anatomy to underlying muscles, blood vessels, nerves, and glands, and
(10) the cerebrospinal circulation and lymphatic drainage of the head and neck.

The student can also expect to be able to identify in the patient:

(1) areas of the oral cavity,
(2) nerve and blood supply to the teeth,
(3) gross structures of the tongue, palate, pharynx, and larynx,
(4) location of major nerves and blood vessels related to the mouth, and
(5) bony prominences of the face and head, boundaries of facial muscles, and superficial muscles of the neck.

The programed instruction method of learning enables the student to move by gradual steps from the familiar to the unknown, from a simple general overview to more minute details. As the program progresses, repetition of previously covered material in new meaningful relationships enhances understanding and memory. The student's active participation involves reading a small segment of material and organizing thoughts to answer questions on that segment. Confidence and satisfaction gained from repeated correct answers provide strong psychological reinforcement. Any erroneous answers are accompanied by a built-in system for immediate detection and clarification of misconceptions at each step.

Original illustrations and redrawings of illustrations copied or modified from other publications are the work of two artists, Lucy B. Watkins and Phillip R. Dotson. The authors acknowledge with deep appreciation the courtesy of the copyright holders of the following publications who granted permission to reproduce or redraw and modify illustrations: *Cunningham's Textbook of Anatomy,* edited by G. J. Romanes, 10th Edition, New York, Oxford University Press; Curtis, *Introduction to the Neurosciences,* Philadelphia, W. B. Saunders Company; Gatz, *Manter's Essentials of Clinical Neuroanatomy and Neurophysiology,* 4th Edition, Philadelphia, F. A. Davis Company; *Gray's Anatomy of the Human Body,* edited by Charles Mayo Goss, 29th Edition, Philadelphia, Lea and Febiger; Jacob and Francone, *Structure and Function in Man,* 3rd Edition, Philadelphia, W. B. Saunders Company; King and Showers, *Human Anatomy and Physiology,* 6th Edition, Philadelphia, W. B. Saunders Company; Leeson and Leeson, *Human Structure,* Philadelphia, W. B. Saunders Company; *Manual of Local Anesthesia in General Dentistry,* New York, Cook-Waite Laboratories, Inc.; *Morris' Human Anatomy,* edited by Barry J. Anson, 12th Edition, New York, McGraw-Hill Book Company; Sicher and DuBrul, *Oral Anatomy,* 5th Edition, Saint Louis, C. V. Mosby Com-

pany; Sicher and Tandler, *Anatomie für Zahnärzte,* Vienna, Austria, Springer Verlag AG; Truex and Carpenter, *Strong and Elwyn's Human Neuroanatomy,* 5th Edition, and Truex and Carpenter, *Human Neuroanatomy,* 6th Edition, Baltimore, The Williams and Wilkins Company; Truex and Kellner, *Detailed Atlas of the Head and Neck,* New York, Oxford University Press: Wolf-Heidegger, *Atlas of Systematic Human Anatomy,* Basel, Switzerland, S. Karger AG; Woodburne, *Essentials of Human Anatomy,* 4th Edition, New York, Oxford University Press.

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A NOTE ON VISUALIZATION

The study of anatomy involves forming mental images of the parts of the body and their positions relative to surrounding structures. The student must visualize in three dimensions as well as employ "X-ray vision" to picture structures which are normally hidden under the skin. Proper visualization can change a burdensome memory chore into an intriguing exploration with a high degree of retention of detail.

The most effective approach is to visualize in terms of structural boundaries, areas and their contents, and the position of an unfamiliar structure as it bounds or approaches a familiar one. Each time the text introduces a new structure, project your imagination to the area described. It aids imagination, in depth projection, to actually touch the appropriate areas of your own head, face, or neck. The text will always discuss an unknown structure in reference to an area which is already familiar.

Soon you will be able to close your eyes and remember the contents and relative position of such an area as the infratemporal fossa—presumably a mystery to you now—just as readily as you can close your eyes and picture the contents and arrangement of items in your desk drawer.

This textbook makes abundant use of illustrations to facilitate depth projection. Each time you are referred to a figure, it is extremely important that you stop and examine it closely. Careful study of the illustrations is essential to mastery of the program.

HOW TO USE THIS BOOK

This book includes 18 Units, each of which is subdivided into a number of Items. Each Item presents a factual explanation of a single topic, followed by several questions. The correct answer to each question appears immediately below the question. Alternative correct answers to the fill-in questions appear in parentheses.

Do not look at the answers given in the book until you have written what you think are the correct answers. Use the piece of cardboard provided to mask the answer below each question while you write the appropriate words in the blanks of a fill-in question or encircle your choice of the alternative answers to a multiple-choice question. Then slide the cardboard cover down the page to reveal the correct answer and check the accuracy of your own answer.

Avoid guessing. If you are not sure of the answer, reread the explanatory part of the Item. The need for such rereading is to be expected occasionally and perhaps even frequently. Rereading the Item will reinforce learning, eliminate vagueness, and enhance your confidence.

Turn now to Item 1 of Unit One and begin the course.

CONTENTS

PART ONE

ANATOMICAL LANDMARKS

Unit One ☐ SURFACE ANATOMY OF THE HEAD AND NECK

STRUCTURES STUDIED IN SURFACE ANATOMY

ITEM 1

A clinician's first impression of a patient comes from the patient's surface anatomical features. The term *surface anatomy* refers to any structure detectable by view or palpation, such as muscle contour or skeletal prominence. The term *topographical anatomy* includes surface features, but also deals with underlying structures and their particular location in terms of level or depth, as projected onto the surface. This unit deals principally with surface anatomy of the face and the anterior neck.

You should cultivate the habit of identifying on others all the surface features treated in this unit. Also, you should locate each structure on yourself by looking into a mirror and by palpating the structure with your fingers. Illustrations of surface structures have been omitted from this first unit deliberately to enable you, from the outset, to form the habit of locating these structures on yourself. Your own face, seen in the mirror and palpated with your fingers, as well as faces of others, provides the most effective illustrations you can have.

QUESTION 1

Surface anatomy studies structures which can be
A. either seen or felt
B. both seen and felt

ANSWER

The correct answer is A. While structures dealt with in surface anatomy are often both visible and palpable, some of the surface features can be palpated even though they may not be visible. Certain muscles of the neck, for example, may not be seen directly but can be palpated easily.

QUESTION 2

Three-dimensional conceptualization of deep structures of the body is termed _____ anatomy.

ANSWER

topographical

ITEM 2 VARIATION OF SURFACE FEATURES

As you begin to observe surface anatomical structures of other people more consciously and closely, you will recognize considerable variation from one individual to another. A rather wide range of variation is entirely normal. A change in the usual appearance or configuration of some surface feature of a given person, however, may signal a condition of important clinical significance. It is the change of appearance in a particular individual more than variation from other individuals which is medically significant.

QUESTION **3** In observing surface anatomical structures, one should attach more clinical importance to _____ in these features in individuals than to their _____ from person to person.

ANSWER changes . . . variation

ITEM 3 THE FOREHEAD

Just above each eyebrow is a *superciliary ridge*. The flattened area between the eyebrows is the *glabella*. In a lateral view, the prominence of the forehead, called the *frontal eminence*, is evident. The frontal eminence is usually more prominent in females, while the superciliary ridges are ordinarily more marked in males.

With your fingers, feel the frontal eminence, superciliary ridges, and glabella on your own forehead. Look at the surface projections of these structures in the mirror. Repeat the names of these surface features to yourself as you see them on other people. You will be surprised at how quickly and easily you can remember the technical names of various structures by observing them on yourself and others and repeating the names as you do so.

QUESTION **4** The glabella is a flattened area *above/between* (circle one) the eyebrows.

ANSWER between

QUESTION **5** When the forehead is viewed laterally, a prominent projection called the _____ eminence can be seen.

ANSWER frontal

The ridge above the eyebrow which is more prominent in males than in females is termed the _____ ridge.

QUESTION 6

superciliary

ANSWER

THE EYES ITEM 4

Each eye consists of an *eyeball* and supporting structures contained within a bony socket called the *orbit*. On the eyeball itself, notice the white of the eye, which is a portion of the *sclera*. The pigmented *iris* gives eyes their various colors. In the center of the iris is the dark opening called the *pupil*. Observe the pupil in a brightly lit room and in rather dim light. It will be much larger in the dim room to admit more light, much smaller in bright light to prevent too much light from entering. The pupil reflexly dilates or constricts to accommodate to the intensity of light.

The bony socket which houses the eye in the skull is called the _____.

QUESTION 7

orbit

ANSWER

The pigmented part of the eye is the _____; the white of the eye is part of the _____.

QUESTION 8

iris . . . sclera

ANSWER

The opening within the iris through which light enters to fall on the retina is called the _____.

QUESTION 9

pupil

ANSWER

The pupil of the eye constricts or dilates reflexly to allow for variations in _____ of light.

QUESTION 10

intensity

ANSWER

ITEM 5 THE EYELIDS

Two movable *eyelids*, an upper and a lower, cover each eye. The outer angle where upper and lower lids meet is termed the *lateral canthus;* the inner angle, the *medial canthus*. The canthi are important radiological landmarks when extraoral radiography is indicated.

Examine the eyelids and lashes. Observe other people as they close and open their eyelids and notice how the upper lid does most of the movement. Observation of the lids is important, since they are often the first places where swelling becomes visible in conditions of *edema*, or accumulation of fluid in the tissues.

QUESTION **11** The lateral canthus is the _____ angle at which upper and lower eyelids meet; the medial canthus, the _____ angle at which the eyelids meet.

ANSWER outer . . . inner

QUESTION **12** The eyelids are among the first tissues to accumulate fluid in the condition called _____.

ANSWER edema

QUESTION **13** In extraoral radiography, the dental clinician uses the lateral and medial _____ as landmarks.

ANSWER canthi

ITEM 6 THE EAR

The external ear comprises the oval *auricle*, which collects sound waves, and the *external acoustic meatus*, the tubelike canal through which sound waves are transmitted to the middle ear. Overhanging the orifice of the external acoustic meatus anteriorly is the cartilaginous *tragus*. Palpation of the tragus will reveal the nature of its cartilage framework. The auricle, external acoustic meatus, and tragus are useful landmarks in dental radiology.

The tube through which sound waves are transmitted from the auricle to the tympanic membrane is called the external _____ _____. QUESTION 14

acoustic meatus ANSWER

The small cartilaginous prominence overhanging the beginning of the external acoustic meatus is the _____. QUESTION 15

tragus ANSWER

The auricle, tragus, and external acoustic meatus serve as landmarks in dental _____. QUESTION 16

radiology ANSWER

THE NOSE ITEM 7

The *root* of the nose is the area between the eyes. As you run a finger down onto the nose from the glabella, you can feel a depression, the *nasion*, which is used in dental radiology as a landmark for correct positioning of the beam. Inferior to the nasion, the bony structure of the *bridge* of the nose can be felt. The immovable bridge is formed by the underlying *nasal bones*. Continuing downward, you can feel the flexible tip, or *apex*, which is supported by cartilage rather than bone. From below the apex, the two nostrils, or *nares*, are visible, separated by a portion of the *nasal septum*. The nares are bounded laterally by the winglike *alae* of the nose.

The nose extends from the _____ between the eyes down to the _____ at the tip. QUESTION 17

root . . . apex ANSWER

The depressed portion of the nose felt between the eyes is termed the _____ _____. QUESTION 18

nasion ANSWER