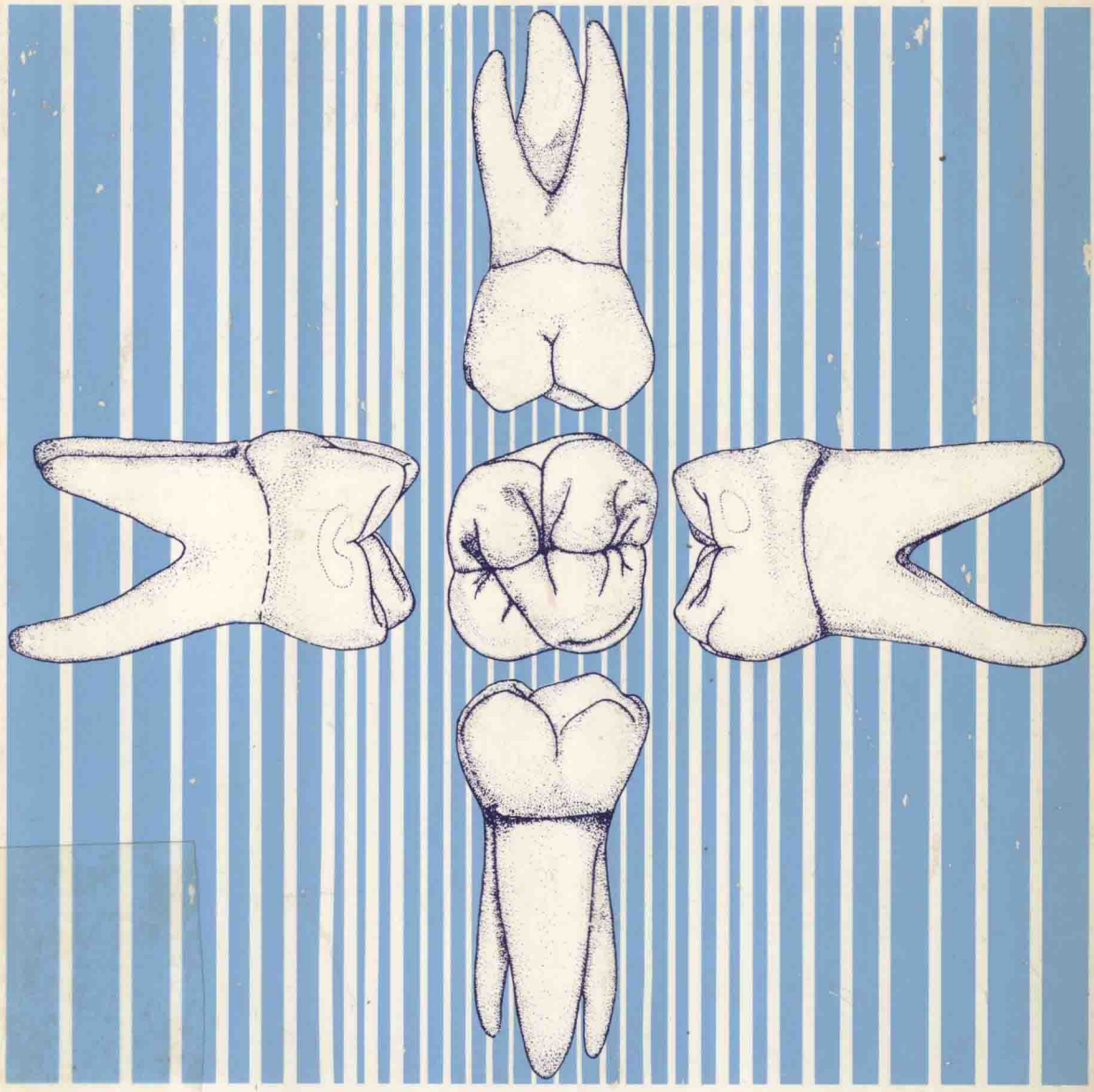
CONCISE
Dental Anatomy
AND MORPHOLOGY

James L. Fuller / Gerald E. Denehy



A Self-Paced Text

Concise
DENTAL ANATOMY
and
MORPHOLOGY

JAMES L. FULLER, D.D.S., M.S.
Associate Professor, Department of Operative Dentistry,
University of Iowa College of Dentistry, Iowa City

GERALD E. DENEHY, D.D.S., M.S.
Professor, Department of Operative Dentistry,
University of Iowa College of Dentistry, Iowa City

Illustrated by William Girsch, D.D.S.

Year Book Medical Publishers, Inc.
CHICAGO • LONDON

Reprinted, July 1979

Reprinted, February 1980

Reprinted, August 1981

Library of Congress Catalog Card Number: 77-72666
International Standard Book Number: 0-8151-3299-9

*From Wheeler, R.C.: *Dental Anatomy, Physiology and Occlusion* (5th ed.; Philadelphia: W. B. Saunders Company, 1974).

CONCISE DENTAL ANATOMY AND MORPHOLOGY

PREFACE

Like any textbook, this manual was originally prepared with specific purposes in mind. Included in these goals were: 1) An attempt to reduce the content, in comparison to traditional textbooks in the field, and 2) The desire to produce a self-paced and self-study student manual to fit in with recent trends in dental education toward individualized and flexible curricula.

The original manual was written solely for dental students. Since all dental school curricula involve the students in in-depth courses in occlusion, histology, anatomy, physiology, etc., this manual only highlighted some of the major premises of these courses, with no attempt to duplicate their detail. It became apparent that this condensed manual was not only appropriate for use by dental students, but was also suitable for use in dental hygiene and dental assistant educational programs. In all of these curricula, courses in dental anatomy are normally placed first, so that they are a basis, or prerequisite, for all future dental science coursework. Therefore, this manual presents a basic core of material, which, if mastered by the student, will provide essential and sufficient knowledge in the area of dental anatomy.

The original manual was prepared in an outline form and, because of the preference of the authors, as well as encouragement from various reviewers, that format has remained. Former students have also generally favored the outline format over the traditional free flowing style.

The content is divided into eleven units, each of which can be thought of as a unit of material for self-study purposes. The specific objectives found at the front of each unit should serve as a study guide for the student, as well as a guide for instructor examination preparation. The material of all units is essential, but the concepts of Unit #2 are basic to the successful practice of dentistry and dental hygiene.

A suggestion for student preparation and study involves the thorough use of the manual illustrations, as well as any models, dentoforms, or extracted teeth which are accessible, or provided by the course

instructor. Experience has revealed the student will retain the material much longer if each item under consideration is referred to a diagram or model. In this manner, the student builds a mental image of a tooth, a surface, or some other structure, which is more permanent than a mere memorization of definitions and descriptions.

Inasmuch as there may be no formal lectures, past experience has revealed that students tend to mispronounce some of the unfamiliar terms found in the manual. Therefore a pronunciation guide is included at the back of the manual.

For most of you, this course is the beginning of your formal studies in the dental health care field. It is the sincere hope of the authors that your participation in this profession, whatever your niche may be, will in some small way make the world a better place in which to live.

JAMES L. FULLER
GERALD E. DENEHY

TABLE OF CONTENTS

Unit #1

I. Reading Assignment:

Manual: Preface
Unit #1 (Introduction and Nomenclature)

II. Specific Objectives:

At the completion of this unit, the student will be able to:

A. Identify either deciduous or permanent teeth by their proper name, when given a diagram or description of their function, arch position, or alternative name. The student should furthermore be able to identify the type and number of deciduous or permanent teeth per quadrant, arch, and in total. The student also should be able to identify the type and number of teeth which are anterior or posterior.

B. Define, or select the correct definition or description from a list, any structure presented in the general anatomy and anatomical structures sections. Furthermore, the student should be able to make applications of these terms to diagrams or situations.

C. Demonstrate a knowledge of dental formulae by supplying, or selecting from a list, the correct information regarding a given dental formula.

D. Indicate the general eruption sequence, or order, for deciduous and permanent teeth, by listing, or selecting from a list, the proper sequences. (It is not necessary to memorize the exact dates of eruption at this time, only the correct order.)

E. Define, or correctly identify from a list, the three periods of man's dentition, as well as their approximate time intervals of existence, and normal initiation and termination events.

F. Define the term "succedaneous," or be able to choose from a list, the tooth or teeth which are succedaneous.

G. Identify, or select from a list, the proper name for tooth surfaces, or thirds of tooth surfaces, when given a diagram, or a description.

H. Select from a list, or supply the correct name for, line or point angles, when given a diagram or description.

I. Demonstrate knowledge of the various numbering systems presented, by supplying, or selecting from a list, the correct name or description for a given symbol, or the correct symbol for a given name or description.

J. Define, or select from a list, the correct definition, or application thereof, for any of the dentition classifications studied.

K. Define, or select from a list, the correct definition of any underlined term not included in any previous objective. Furthermore, the student will be able to make applications of these terms to descriptions, diagrams, or situations.

UNIT #1

INTRODUCTION AND NOMENCLATURE

I. Introduction:

A. The teeth are arranged in two arches (upper and lower). The teeth in the upper arch are termed maxillary, because they are set in the upper jaw, which is the maxilla. (Plural - maxillae). The teeth in the lower arch are termed mandibular, because they are set in the lower jaw, which is the mandible. The mandible is the movable member of the two jaws, while the maxilla is stationary.

B. The imaginary vertical line, which divides each arch, as well as the body, into two approximately equal halves, is the midline. Strictly speaking, this vertical division is not a one-dimensional line at all, but rather a two-dimensional plane, termed the mid-sagittal plane. However, since most dental authors persist in using the less appropriate term, "midline," this text, for reasons of consistency, will also use it. The two approximately equal portions of each arch divided by the midline are termed quadrants, since there are four in the mouth as a whole. They are termed:

maxillary (upper) right.
maxillary (upper) left.
mandibular (lower) right.
mandibular (lower) left.

C. The term for the process of biting or chewing of food is mastication. Another similar term is comminution, or the crushing into small pieces. The manner in which the mandibular teeth contact the maxillary teeth is called occlusion.

D. It is important to point out that as one looks directly at the oral cavity (or the body) from the front, the directions of right and left are reversed. Hence, the right side of the mouth is actually to the left of the viewer, while the left side of the mouth is to the right of the viewer.

II. Classification of Dentitions:

A. The human dentition is termed heterodont since it is comprised of different types, or classes, of teeth to perform different functions in the mastication process. In comparison, homodont refers to a dentition in which all of the teeth are the same in form and type. This type of dentition is found in some of the lower vertebrates.

B. Furthermore, man has two separate dentitions, the deciduous dentition and the permanent dentition. This is termed a diphyodont dentition, as opposed to the dentitions of some other animals, which are termed monophyodont, when there is only one set of teeth, and polyphyodont, when several (more than two) or continuous sets of teeth are developed throughout life.

C. In man, the two dentitions are termed deciduous and permanent, while the transitional phase when both deciduous and permanent teeth are present, is called the mixed period of dentition.

1. Deciduous dentition - The teeth of the first, or primary dentition. They are so named because they are shed (or exfoliated). They erupt into the mouth from about 0-2 years of age. Normally there are 20 total deciduous teeth. Other non-scientific names for the deciduous teeth include "milk" teeth, "baby" teeth, and "temporary" teeth.

2. Permanent dentition - The teeth of the second, or adult dentition. Normally there are 32 permanent teeth and they erupt from 6-21 years of age.

III. Classification of the Teeth:

A. Permanent Dentition:

As was pointed out, man has a heterodont dentition, which means that more than one type of tooth is found in his dentitions. Each quadrant of his permanent dentition normally contains 8 teeth of differing type and function.

1. Incisors (2) - The two teeth of each quadrant which are closest to the midline, and they are named central and lateral incisors. Their function in mastication is cutting and incising. There are four permanent incisors per arch, and a total of eight in the mouth.

2. Canine (1) - The canine is the third tooth from the midline in each quadrant. Its function in mastication is cutting, tearing, piercing, and holding. It also is called a cuspid. There are two permanent canines per arch, and a total of four in the mouth.

3. Premolars (2) - The fourth and fifth teeth from the midline. Their masticatory purpose is tearing, holding, and grinding. They are also called bicuspids. They are termed first and second premolars (or bicuspids). As with the incisors, there are four per arch, and eight total premolars.

4. Molars (3) - The sixth, seventh and eighth teeth from the midline. They are termed first, second, and third molars. They are also called six-year molar, twelve-year molar, and wisdom tooth, in that order. Their function is grinding. There are six permanent molars per arch and twelve total molars.

B. Deciduous Dentition:

Each quadrant of man's deciduous dentition contains the following types of teeth, all of which have a function similar to their permanent complements:

1. Incisors (2), which are named central and lateral incisors.

2. Canine (1), or cuspid.

3. Molars (2), which are named first and second molars.

Therefore, there are five deciduous teeth per quadrant, ten per arch, and a total of twenty in the primary dentition.

IV. Dentition Periods and Succedaneous Teeth:

A. It has been pointed out that man has two dentitions, but three periods of dentition, since the deciduous and permanent dentitions overlap in time. These periods are summarized in the following manner:

1. The primary dentition period is that period during which only deciduous teeth are present (approximately six months to six years of age). The primary dentition period ends at about age six, with the eruption of the first permanent tooth, normally the mandibular first molar.

2. The mixed dentition period is that period during which both deciduous and permanent teeth are present (approximately six years to twelve years of age). The mixed dentition period ends around age twelve, with the exfoliation of the last deciduous tooth, normally the maxillary canine.

3. The permanent dentition period is that period during which only permanent teeth are present (approximately twelve years through the rest of life).

B. It is rather obvious that for a permanent tooth to erupt into a space where a deciduous tooth is located, the deciduous tooth must first be shed or exfoliated. The natural process by which deciduous roots are "melted away" to allow for exfoliation, is termed resorption.

C. Permanent teeth that replace exfoliated deciduous teeth in the mouth are called succedaneous teeth, which simply means "succeeding" deciduous teeth. Since there are twenty deciduous teeth to be replaced, there must be twenty succedaneous teeth. The permanent teeth, which are also succedaneous teeth, include the incisors and canines, which replace their deciduous counterparts, and the premolars which replace the deciduous molars. Therefore, the only permanent teeth which are not succedaneous are the molars. It may be said, then, that all succedaneous teeth are permanent teeth, but all permanent teeth are not succedaneous teeth.

V. Dental Formulae:

A. Dental formula - A number and letter designation of the various types of teeth found in a dentition.

The dental formula indicates the dentition of only one side of the mouth (both upper and lower quadrants), and so must be multiplied by a factor of two to provide the total number of teeth in the dentition.

B. Thus, the dental formula for man's permanent dentition is as follows:

$$I - \frac{2}{2};\ C - \frac{1}{1};\ P - \frac{2}{2};\ M - \frac{3}{3}\ (X\ 2 = 32\ \text{Total Teeth})$$

C. The deciduous dentition for man has the following dental formula:

$$I - \frac{2}{2};\ C - \frac{1}{1};\ M - \frac{2}{2}\ (X\ 2 = 20\ \text{Total Teeth})$$

It should be kept in mind that animals other than man may have differing dental formulae.

VI. General Eruption Pattern:

Both the deciduous and permanent dentitions have a general order, or pattern, of eruption. For the deciduous dentition this pattern normally is as follows:

A. Deciduous Dentition: Normal Eruption Sequence

1. Mandibular central incisor
2. Mandibular lateral incisor
3. Maxillary central incisor
4. Maxillary lateral incisor
5. Mandibular first molar
6. Maxillary first molar
7. Mandibular canine
8. Maxillary canine
9. Mandibular second molar
10. Maxillary second molar

As a general rule, mandibular deciduous teeth normally precede their maxillary counterparts in

eruption. It can also be said that the deciduous teeth normally erupt in order from the front of the mouth toward the back, with the exception of the canines, which normally erupt after the first molars.

B. Deciduous Dentition: Normal Eruption Time

	Eruption Age (Months)			
	Mandible	Order	Maxilla	Order
Central Incisor	6	1	7½	1
Lateral Incisor	7	2	9	2
Canine	16	4	19	4
First Molar	12	3	14	3
Second Molar	20	5	24	5

C. Permanent Dentition: Normal Eruption Sequence

1. Mandibular first molar
2. Maxillary first molar
3. Mandibular central incisor
4. Mandibular lateral incisor
5. Maxillary central incisor
6. Maxillary lateral incisor
7. Mandibular canine
8. Mandibular first premolar
9. Maxillary first premolar
10. Mandibular second premolar
11. Maxillary second premolar
12. Maxillary canine
13. Mandibular second molar
14. Maxillary second molar
15. Mandibular third molar
16. Maxillary third molar

As can be seen, the mandibular permanent teeth also normally precede their maxillary counterparts in eruption. However, the permanent maxillary teeth do not follow as closely to the deciduous teeth when considering their anteroposterior order of eruption. The first molars are the first permanent teeth to erupt, and the maxillary canine follows both maxillary premolars.

D. Permanent Dentition: Normal Eruption Time

Eruption Age (Years)				
	Mandible	Order	Maxilla	Order
Central Incisor	6-7	2	7-8	2
Lateral Incisor	7-8	3	8-9	3
Canine	9-10	4	11-12	6
First Premolar	10-12	5	10-11	4
Second Premolar	11-12	6	10-12	5
First Molar	6-7	1	6-7	1
Second Molar	11-13	7	12-13	7
Third Molar	17-21	8	17-21	8

VII. Numbering Systems:

A. Numbering systems in dentistry serve as abbreviations. Instead of writing out the entire name of a tooth, such as permanent maxillary right central incisor, it is customarily ascribed a number, letter, or symbol, such as #8 in the case of the tooth in question for the universal numbering system. Of the many systems in usage today, the three most common ones will be described.

B. Universal Numbering System:

1. The numbering system with the most wide spread usage is the universal system. It assigns a different number in a consecutive arrangement for all permanent teeth, and a number-letter, or letter to each of the deciduous teeth.

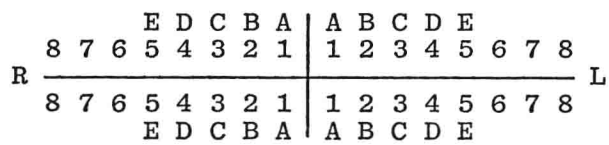
2. Permanent Teeth - The universal numbering system assigns a specific number to each permanent tooth. The upper right third molar is #1, the upper right second molar #2, and so forth around the entire maxillary arch to the upper left third molar, which is #16. At this point, the succession drops to the lower left third molar which is #17, and continues around the entire mandibular arch to the lower right third molar which is #32.

For example, tooth #11 is the permanent maxillary left canine.

3. Deciduous Teeth - The twenty teeth of the deciduous dentition are numbered in the same manner (1-20), except that a small (d) is added as a suffix to each number to designate deciduous. The deciduous upper right second molar is thus #1d, while the upper left second molar is #10d. The lower right canine, for example, is #18d. Another common system for deciduous teeth utilizes the capital letters A through T, instead of numbers, along with the same sequence. Thus the lower right canine, for example, would be R.

C. Palmer Notation Method:

Another commonly used numerical and letter notation scheme for identifying an individual tooth utilizes a simple symbol, which differs for each of the four quadrants, plus the numbers 1 through 8 to identify central incisor through third molar in the specified quadrant. Letters A through E, with the quadrant symbol, are used for the deciduous dentition.



Specific examples are:

⌟6⌞ = Permanent maxillary right first molar

⌞3⌟ = Permanent maxillary left canine

⌜B⌝ = Deciduous mandibular left lateral incisor

⌜4⌟ = Permanent mandibular right first premolar

D. FDI System:

The Federation Dentaire Internationale (FDI), the international dental organization, has