

**THE DISEASES AND TREATMENT
OF THE INVESTING TISSUES OF
THE TEETH, EXTENSION LECTURE
3, DECEMBER 27, 1915 -
JANUARY 7, 1916**

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The Diseases and Treatment of the Investing Tissues of the Teeth, extension lecture 3, December 27, 1915 - January 7, 1916 by Arthur D. Black

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UNIVERSITY OF CALIFORNIA
COLLEGE OF DENTISTRY

EXTENSION LECTURES

3

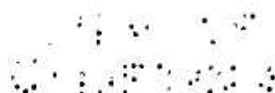
**THE DISEASES AND TREATMENT OF THE
INVESTING TISSUES OF THE TEETH**

BY

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INTRODUCTION

Before taking up the work for which we are assembled, I wish to express my appreciation of the honor conferred by the University of California in extending to me an invitation to be one of the lecturers of this Institute. I am pleased also to say a few words in commendation of the action of the University of California in adding dental courses to its extension work. It is a compliment to the profession that the importance of our service to humanity is thus recognized, and I trust that these courses will in future years continue to receive the hearty support of the profession. I wish, before this class, to compliment Dean Millberry for having seen the need of courses under University control, by men without the sphere of influence of commercial interests, and for having suggested the plan to the University authorities. Such courses should stimulate the members of the profession to keep closely abreast of the times and improve the general average of dental service. Thus we see that the University of California is promoting a scheme in which the people of the entire State should be interested, for they will in the end be the beneficiaries.

The treatment of disease improves with more complete knowledge of pathology. For each disease, we should be able to apply treatment closer to the source, more directly to the cause, or actually to prevent it, as our understanding of the pathology becomes more perfect. We are all familiar with the gradual advancement in the treatment of typhoid fever, especially in the prevention of it by improved sanitation when the methods of transmission became known, and by vaccination after the effect of the infection in the development of antibodies was understood. The discovery of the role which the mosquito played in the transmission of yellow fever and malaria made it possible for our government to carry to completion the construction of the Panama Canal, the failure of the French attempt having been due principally to the ravages of these diseases.

A careful review of the literature of dentistry reveals little other than very meager statements of the pathology of the diseases of the periodontal membrane. The very large majority of writings on this subject concern themselves with names applied by various authors, with theories as to local and systemic causes, and with statements emphasizing the necessity of removing deposits from roots of the teeth. Very few men seem to have made a serious effort to study

* This course of lectures follows closely the recently published book *Special Dental Pathology*, by the late Dr. G. V. Black (Medico-Dental Publishing Co., Chicago; Claudius Ash, Sons and Co., London, 1915), credit to which is hereby acknowledged. The illustrations herein were reproduced from the same book, as were about one hundred and fifty stereopticon slides used to illustrate the lectures.

and present in detail the pathological changes which take place or to differentiate the various diseases to which the investing tissues are subject. It is not surprising, therefore, that the many plans of treatment have generally been unsuccessful. As a basis for the institution of more rational treatment, this course of lectures will be devoted largely to studies of the histology, physical functions and pathological changes in these tissues. After a time we will come to realize that many of us have been endeavoring to accomplish the impossible.

The periodontal membrane is defined as the soft tissue which serves to connect the root of the tooth with the bone of the alveolar process. We might refer to it as the connecting link between chronic infection of the mouth and the general health, since there is practically always a break in this tissue which permits the infective agent to enter the circulation and be carried to distant parts. We might also think of this tissue as that which must bind together the medical and dental professions in their fight against the ever-increasing list of diseases which are recognized as occurring secondary to focal infections. We are concerned chiefly with the dentist's part in protecting the health of his patients, but we will not overlook his duty to conserve the teeth.

Disease of the periodontal membrane does not occur except as a result of (1) a preceding gingivitis or (2) the death of the dental pulp. In the one case there may occur a detachment of the tissue from the cementum beginning at the gingival line of the tooth, with the formation of a pus pocket alongside the root; in the other, the detachment occurs about the apex of the root with the development of a chronic alveolar abscess. It will be noted later that the pathological changes in both cases are similar and that we are confronted with the same difficulties in protecting the general health from the effects of these foci. We will come to realize also that the danger to health demands the elimination of all such foci.

The chronicity of these diseases has led to much confusion in our ideas and knowledge of the pathology. It is not unusual for cases to run twenty or thirty years before all of the teeth are lost, and few dentists have the opportunity to observe many cases from beginning to end. It is not strange, therefore, that we have failed to associate the early symptoms with those of the well-established lesion. Especially have we failed to recognize the relationship between the apparently harmless gingivitis and the secondary serious and generally incurable periodontitis. We must learn to correlate the clinical pictures presented by many cases in various stages of progress and, from these, make a composite which will give us a better understanding of the progressive changes which occur.

We must differentiate several distinct diseases of the gingivae and periodontal membrane as to their causation, pathology, and treatment, and

in doing this we must have a new nomenclature. Terms which have been applied to a group of diseases must be dropped and others substituted which designate each condition; for the retention of the general terms serves to continue in our minds the confusion which has prevailed. In order to have a clear understanding of the pathology, we require terms which will separate definitely the inflammations of the gingivae from those of the periodontal membrane, for it will be pointed out that we may generally cure the one, and practically never the other. Therefore, successful preventive treatment of diseases of the periodontal membrane necessitates a clear understanding of the pathology, a recognition of the early stages, and the institution of treatment while there is opportunity to effect a cure.

FIRST LECTURE

HISTOLOGY AND PHYSICAL FUNCTIONS OF THE INVESTING TISSUES OF THE TEETH

The gums, gingivae, cementum, periodontal membrane, and the bone of the alveolar process may all be considered as the investing tissues of the teeth. It is important that we have a clear understanding of the histological structure and physical functions of these tissues, in order that we may appreciate the significance of the pathological changes which occur. This will, in turn, lead to more rational treatment. It is especially desirable that we realize the interdependence of these structures upon each other in the performance of their normal functions.

GUMS AND GINGIVAE

The gums and gingivae are made up of a pavement epithelium supported by a base of connective tissue. The epithelium of the gingivae is more dense than that of the gums, the cells being very flat and closely packed together on the surface. They are well supported by many long legs of connective tissues, each of which carries one or more blood vessels far into the epithelial covering. Provision is thus made for the rapid regeneration of the superficial cells, which are frequently injured or worn away as a result of the wear and tear to which they are subjected in mastication. This arrangement also insures prompt healing of injuries to the gingivae and enables this tissue to withstand long-continued or often repeated irritation without serious harm. The gum tissue is a rather insensitive tissue, offering little complaint to injuries which would excite much pain in other tissues. Occasionally, however, long-continued irritation, as the rubbing of the edge of a denture, will develop extreme hypersensitiveness.

It will be noted from the above that one of the important functions of the gingivae is that of protecting the underlying periodontal membrane and alveolar process. In fact, this seems to be the principal function of the gingivae. In addition, they doubtless are of material service in maintaining the teeth in the line of the arch.

It is important that we be familiar with the nomenclature of the gingivae and periodontal membrane. We may apply the term gingivae to all the soft tissue which rests upon and extends crownwise from the

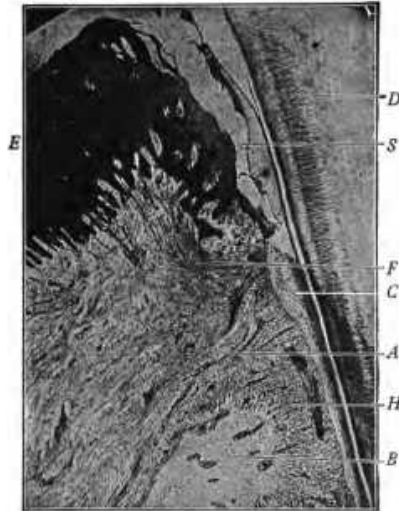


Fig. 1. Longitudinal section through the gingiva and the gingival portion of the periodontal membrane, (E) Epithelium. (D) Dentin. (C) Cementum. (S) Subgingival space. (F) Free gingivae group of fibres. (A) Alveolar crest group of fibres. (H) Horizontal group of fibres. (B) Bone of alveolar process.—Noyes.

crest of the alveolar process. This may be subdivided into the body, which, encircling each tooth, extends from the crest of the alveolar process to the level of the gingival line of the tooth, the gingival line being the line of junction of cementum and enamel. The free gingivae are those portions which overlie the enamel on the buccal, labial and lingual surfaces of the teeth, and the septal gingivae are the similar portions which occupy the septal or interproximal spaces. We will have occasion to refer frequently to the subgingival spaces—those spaces between the free gingivae and the enamel, or between the septal gingivae



and the enamel. Under normal conditions, a thin, flat blade may be passed into the subgingival space, between the free gingivae and the enamel, until it comes in contact with the attachment of the periodontal membrane to the cementum at the gingival line of the tooth.

The gingivae and periodontal membrane contain several groups of principal fibres which may be named and briefly described in order, beginning at the gingival line and progressing toward the apex of the root as follows:

The free gingivae group is composed of those fibres which extend outward from the cementum just beyond the gingival line and then turn

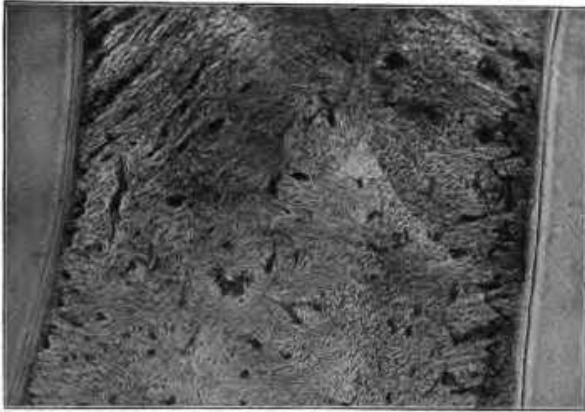


Fig. 2. A portion of the periodontal membrane between two incisors of a young sheep, showing the trans-septal fibres extending from tooth to tooth.—Noyes.

occlusally into the free gingivae. These fibres help to support the free gingivae and assist in maintaining their close adaptation to the teeth.

The trans-septal group consists of a strong band of fibres passing from tooth to tooth through the body of the septal gingivae, occlusally of the crest of the interproximal portion of the alveolar process. The principal function of this group of fibres is to maintain the contacts between the various teeth—to keep the contacts tight. It is necessary to appreciate the function of these fibres in order to understand the movements of the teeth and the progressive involvement of several proximal surfaces from an original pus pocket on a proximal surface. This will be fully explained later.



The alveolar crest group consists of those fibres which extend outward from the cementum and are attached to the crest of the alveolar process. Their principal function seems to be to steady the tooth against lateral strain.

The horizontal group consists of those fibres which extend outward at right angles to the long axis of the tooth and are attached to the bone of the alveolar process, just below its crest. These fibres act with those of the alveolar crest group in preventing too much lateral movement of the teeth.

The oblique group consists of the fibres which make up the bulk of the periodontal membrane. They are attached to the greater part of the surface of the root, and extend in an oblique direction occlusally to the bone of the alveolar process, serving to swing the tooth in its socket and support it against the stress of mastication.

The apical fan-shaped group consists of the many bundles of fibres attached about the apex of the root which radiate in all directions and are attached to the surrounding bone. These fibres tend to maintain the apex of the root in its central position in the socket.

CEMENTUM

The cementum is one of the most important tissues to be considered, for its peculiar structure is in large measure responsible for the chronicity of diseases of the periodontal membrane. The cementum is continuous growing, being gradually built by the cementoblasts which lie upon its surface. These cells are to be considered as an integral part of the periodontal membrane, as they occupy the space between the fibres and, by their action, build cementum around the fibres, thus attaching them to the root.

Cementum is closely analagous to the subperiosteal bone. It is built by cementoblasts lying on its surface, as is subperiosteal bone by the osteoblasts on its surface. The most important difference is that bone has a circulation of blood within and throughout its structure, while cementum has not. This is a very important fact to remember. When there is a suppurative detachment of the periosteum from bone, the underlying bone dies. Then, as a result of the circulation within the bone, a line of demarkation is established and the dead bone is exfoliated. When the periodontal membrane is detached from the cementum by suppuration, the death of the cementum occurs in the same manner, but owing to the lack of circulation within the cementum, the dead portion cannot be thrown off, but remains as a constant irritant to the overlying tissue. This is the principal factor in maintaining the chronicity of the pus pocket alongside the root and the chronic alveolar abscess.

