NUTRITION AND DENTAL DISEASE

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FOR many years pathologic lesions of the oral cavity received a consideration purely mechanistic, both as to cause and treatment, from the medical and dental professions. With knowledge of bacterial activity and later the introduction of theories regarding focal infection, the teeth and supporting structures in their vulnerable position of accessibility to operative procedures received an undue amount of attention. In many cases dental lesions may unquestionably have existed as primary foci, but in the enthusiasms engendered by that convenient hook—focal infection—upon which to hang misunderstood body disabilities, undoubtedly countless unnecessary sacrifices were made. As knowledge of degenerative diseases progressed, and with the recognition that degenerative diseases of many types were increasing, a more sane and logical attitude has developed. It is recognized by those practitioners in medicine and dentistry who have followed closely events of the last two decades, that the oral structures, while possessing a remarkably high vitality and resistance, are but vital parts of the organism and subject to all of its fluctuations in health. Lesions of the oral structures are to be considered symptoms rather than primary diseases.

With the understanding that nutrition is the process by which growth is promoted and health maintained, and that disease represents disturbed nutrition of the cell, part, or organism affected, dental pathologic lesions receive a more logical consideration than is possible from the mechanistic point of view.

Pathologic lesions of the oral cavity which the dentist is called upon to treat fall into three main groups:

1. Lesions or degenerative changes of the supporting and investing structures of the teeth—paradentopathies.
2. Destructive lesions of the structure of the tooth itself—dental caries.
3. Malformation or maldevelopment of the facial bones and dental arches.

Paradentosis (periodontoclasia, pyorrhea alveolaris)

The relation of the tooth to the jaw, the dento-alveolar articulation, is similar to other joints of the body, having all the elements of other articulations, even including minute movement. Therefore, disturbances in this joint relationship may be interpretable as arthritic manifestations. Supporting this concept is the fact that chronic degenerative arthritis (hypertrophic) frequently shows typical changes of this character in the dento-alveolar articulation. The rationale of more than local treatment becomes evident.

Dental Caries

The all prevalent and increasing incidence of dental caries closely corresponds to the increased use of refined and concentrated carbohydrates in the national diet. Widespread clinical experience in successful control of dental caries through the restriction or elimination of the concentrated sugars has demonstrated this relationship.[1,2,3] That high refined carbohydrate diets with avitaminosis demineralize the skeleton, has long been recognized by the medical profession, but frequently the degree of bone demineralization accompanying rampant dental caries has been overlooked.

Malformation

Paradentosis and dental caries are postnatal diseases in that they are imposed upon the organism. The view that malformation and maldevelopment of the jaws and facial bones are the result of injuries to the germ plasm in the parents prior to conception has been well supported by animal experiment and clinical observation.[4,5,6,7] The previously mentioned postnatal lesions imposed on the pa-

Reprint from Annals of Western Medicine and Surgery, September, 1947

fined carbohydrates without deleterious dental changes.

SUMMARY AND CONCLUSIONS

1. Inclusion of a proportion of refined grain and sugar products in the diet beyond the tolerance of the patient appears as the chief causative factor in dental caries and paradentosis.

2. Proportionately as the phosphorus intake increases beyond the one and one-half ratio to calcium, the vertical atrophy of paradentosis increases.

3. For prevention and control of dental disease, diets of 2,000 calories may not safely be diluted by refined grain and sugar products. As the total caloric intake increases, a possible inclusion of 6 to 10 per cent of these products may have no harmful effect.

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DISCUSSION

Dr. James is to be commended for his clear cut statements with reference to the importance of nutrition in the maintenance of oral health, and also for bringing out the fact that disturbances in the oral cavity are indicative of general systemic disease. Although the internist may not always be able to determine the correlation between the evidences found in the mouth and his patient's systemic problems, a closer study of the oral structures, however, will give him diagnostic aids that will prove of utmost value.

It has been my experience, as Dr. James brings out so clearly, that malformations of the facial structures, which also include the paranasal sinuses and all other structures beneath the brain case, usually result from disturbed nutrition in the parentage. Caries, on the other hand, is much more likely to represent a highly refined dietary intake on the part of the individual. Many cardiologists have pointed out that there seems to be a close relationship between dental caries and heart disease. As a rule, the consumption of refined carbohydrates in excess is attended by the development of water bearing tissue of diminished tone throughout the body. Although Dr. James stresses the calcium-phosphorus ratio in relation to paradentosis, predicated on the dietary analyses of Mr. Walsh, it has been my experience that there are other important factors as well. Not the least of these is the extensive sterilization by high heat that is practiced by modern civilization, thereby destroying important enzymes necessary for the utilization of the foods we consume.

It has also been my experience that rarely do my dental confreres give me a report of horizontal atrophy or osteoporosis in oral structures but that I find evidence, on careful study of other bony structures of the body, of either developmental failure or skeletal inadequacy. This may take the form of a true loss of bone density from the skeleton, a disturbance of its internal structural pattern, or a definite change in the articular surfaces. There has been too great a tendency on the part of the physician to minimize the importance of the reports of his dental colleagues. Close cooperation between the medical and dental practitioner should enable the internist to make much earlier diagnosis of impending skeletal failure with its concomitant organic and structural changes in other parts of the body. The dental radiologist obtains a very clear roentgenogram of the oral structures by the close proximity at which he takes his pictures. Hence, he may be the first to observe a serious change in bony structure.

The physician who has interested himself in the importance of less refined foods in the dietary is well aware of the therapeutic implications of the statements that Dr. James has made. The interesting correlations which he reports in the analysis of Mr. Walsh will be appreciated by practitioners interested in the long range health program of their patients.

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Original journal version (complete)

Annals of Western Medicine and Surgery 1(7), 277-280, 1947.

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FOR many years pathologic lesions of the oral cavity received a consideration purely mechanistic, both as to cause and treatment, from the medical and dental professions. With knowledge of bacterial activity and later the introduction of theories regarding focal infection, the teeth and supporting structures in their vulnerable position of accessibility to operative procedures received an undue amount of attention. In many cases dental lesions may unquestionably have existed as primary foci, but in the enthusiasms engendered by that convenient hook—focal infection—upon which to hang misunderstood body disabilities, undoubtedly countless unnecessary sacrifices were made. As knowledge of degenerative diseases progressed, and with the recognition that degenerative diseases of many types were increasing, a more sane and logical attitude has developed. It is recognized by those practitioners in medicine and dentistry who have followed closely events of the last two decades, that the oral structures, while possessing a remarkably high vitality and resistance, are but vital parts of the organism and subject to all of its fluctuations in health. Lesions of the oral structures are to be considered symptoms rather than primary diseases.

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mineralize the skeleton, has long been recognized by the medical profession, but frequently the degree of bone demineralization accompanying rampant dental caries has been overlooked.

Malformation

Paradentosis and dental caries are postnatal diseases in that they are imposed upon the organism. The view that malformation and maldevelopment of the jaws and facial bones are the result of injuries to the germ plasm in the parents prior to conception has been well supported by animal experiment and clinical observation.[4,5,6,7] The previously mentioned postnatal lesions imposed on the parents prior to conception are to be considered among the probable causes of germ plasm injury, with resultant need for orthodontic treatment in the succeeding generation. Today there are more dentists in the practice of orthodontics than ever before and still they are unable to care for all children needing their services. This increased requirement has often erroneously been attributed to better diagnostic methods and improved treatment possibilities. A comparison of those young persons requiring treatment, or who have already received treatment, with parents in the age bracket of 40 or more will disclose the fact that in a great majority of the cases neither parent has required orthodontic treatment. Occasionally one of the parents has required such treatment. Parents in the age bracket below 40 years show increasing evidences of past orthodontic treatment or indications that such would have been beneficial, and in the still younger age bracket of those potential parents now entering adult life an amazing universality of orthodontic treatment or its unfortunate omission is apparent.

Phosphorus-Calcium and Acid-Base Ratios

Seven-day dietary analyses made by one laboratory* of more than 10,000 dental patients in southern California over the past ten years have shown certain dietary faults constant in cases of paradentosis and dental caries. Frequently the two are active together in the same person.

Patients displaying active paradentosis show an intake of phosphorus exceeding the desired one and one-half ratio to calcium (1 Ca:1.5 P). Such excesses may appear as 1:1.8, and may range to such extremes as 1:3.5 in severe cases of vertical atrophy. The ratio is the important consideration; both calcium and phosphorus may be grossly deficient. Rarely is the phosphorus found to exceed the recommended 1.5 grams daily. The ratio of acid-ash to base-ash foods is usually also unfavorable, but the important diagnostic factor lies in the calcium-phosphorus ratio.

Patients with active dental caries show a marked deviation toward parity from the desired intake of acid-ash and base-ash foods in the ratio of 1:3, with this deviation due to the inclusion of large proportions of refined grain and sugar products. Such cases may show a ratio of 1 acid:0.8 base. Patients with lesser susceptibilities may show such a ratio as 1:2. The calcium-phosphorus ratio is frequently correct, or nearly so. Fortunately, a very accurate check method on these cases is possessed in the Lactobacillus acidophilus index determinations.

Some analyses will show both the calcium-phosphorus imbalance and the acid-base imbalance, and if the latter is caused by acid-ash, refined grain and sugar products in the diet, we may be confident that both dental diseases

*American Foundation for Dental Science. Complete biostatistical studies will be published shortly.

are active. As stated above, the caries susceptibility may easily be verified.

Occasionally in very high protein, high fat diets, with no refined carbohydrates, a marked acid-base imbalance exists. In such cases active dental caries is not found. The dental symptoms, if any, appear to be in the dento-alveolar articulation, with a sensation of looseness in one or more teeth. The patient is apt to be conscious of the teeth in walking or otherwise jarring, and may note stiffness or soreness in other joints.†

Vertical Atrophy—5 cases. These patients with vertical atrophy, that is with deep pockets, true paradentosis, but uncomplicated by dental caries, showed an average calcium-phosphorous ratio of 1:2.26. The acid-base ratio of 1:1.62 was slightly improved, but 24 per cent of the total caloric intake was derived from refined grain and sugar products.

Active Dental Caries and Vertical Atrophy—17 cases. These patients displayed both active dental caries and vertical atrophy (pocket formation of paradentosis). In these patients the average calcium-phosphorous ratio was 1:1.85, with an acid-base ration of 1:1.4. Thirty-six per cent of the total caloric intake was derived from refined grain and sugar products.

AVERAGES OF 55 DIETS
OF DENTAL PATIENTS

LESIONS	CASES	RATIO CA: P	RATIO ACID: BASE	TOTAL CALORIC INTAKE	PERCENTAGE OF TOTAL FROM REFINED GRAIN AND SUGAR PRODUCTS
Dental Caries	24	1: 1.64	1: 1.3	2050	31.6%
Vertical Atrophy	5	1: 2.26	1: 1.62	1944	24 %
Caries and Vertical Atrophy	17	1: 1.85	1: 1.14	1752	36 %
Horizontal Atrophy and Osteoporosis	4	1: 1.52	1: 1.05	1762	27.2%
Controlled	5	1: 1.26	1: 1.98	2148	6 %

A G J

The accompanying table shows the important dietary relationships in 50 patients in the author's practice of general dentistry.

Active Dental Caries—24 cases. It will be noted that the calcium-phosphorous ratio of 1:1.64 was not extreme. The ratio of acid-ash foods to base-ash foods was 1:1.3, but of the total food intake 31.6 per cent of the calories were derived from refined grain and sugar products. These patients displayed varying degrees of osteoporosis in the alveolar processes. In many, Lactobacillus acidophilus index determinations have been made over a period of months.

Horizontal Atrophy and Osteoporosis—4 cases. These patients with horizontal atrophy and osteoporosis, without either dental caries or pocket formation, showed an average calcium-phosphorous ratio very nearly correct 1:1.52, but the acid-base ratio was down to 1:1.05. Of the total caloric intake 27.2 per cent was derived from refined products of grain and sugar. These four patients showed marked signs of vitamin B complex deficiency, and in the light of investigations in the buffer capacity of saliva made at the Spies Clinic, Hillman Hospital, Birmingham, Alabama, should be investigated in this phase. The Birmingham studies showed that malnourished patients, relatively free from dental caries, had the highest buffer capacity in the saliva.[8,9]

The 5 controlled cases are rechecks made from a group in which there has been total arrest of destructive dental changes for a period of six

†The writer believes this form of arthritis may explain the sudden death of the dental pulp with acute sequelae which has been observed in such circumstances of acid-base imbalance, and in the absence of either vertical atrophy or dental caries.

months to several years. One of the patients, who had rampant dental caries, has been under observation since April 1942, a total of sixty-three months. Through the cooperation of the Department of Dental Medicine, College of Dentistry, University of California, San Francisco, 49 Lactobacillus acidophilus index determinations have been made in this period. In April 1942 the patient presented with 46 tooth surfaces affected by dental caries, 14 of which were active at that time. During the period of observation, five years and three months, new dental caries has not occurred. In this series of controlled cases the calcium-phosphorous intake ratio of 1:1.26 is to be noted, as is the relationship of acid-ash foods to base-ash, 1:1.98. It will also be seen that these 5, following rather closely the prescribed diet, have increased the average daily caloric intake to 2148 calories with only 6 per cent of that amount derived from refined grain and sugar products.

The recapitulations of the 50 cases here presented are in agreement with the substance of the vast number of analyses collected over the past ten years through the cooperation of many practitioners in California. They represent the utilization of diagnostic and corrective methods available in the clinical practice of dentistry, and are not offered as part of a research program. I believe that the refined carbohydrates to which Moose[10] refers as "diluting agents" cannot be estimated in their deleterious effects by quantitative measurements, but must be considered in direct relationship to the total caloric intake, its quality and, very importantly, to the patient's metabolic capacity or efficiency. In a diet averaging 2000 calories daily, there appears no displacement possible by inadequate refined carbohydrates without deleterious dental changes.

SUMMARY AND CONCLUSIONS

1. Inclusion of a proportion of refined grain and sugar products in the diet beyond the tolerance of the patient appears as the chief causative factor in dental caries and paradentosis.

2. Proportionately as the phosphorus intake increases beyond the one and one-half ratio to calcium, the vertical atrophy of paradentosis increases.

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MENIERE'S DISEASE: ENDOLYMPHATIC HYDROPS

This is the subject of discussion, with presentation of five case reports, in an article in *Minnesota Medicine,* April, 1947, by Dr. Lawrence R. Boies. He summarizes as follows:

"A microscopic study of the temporal bones of a number of persons known to have had Meniere's disease during life has revealed evidence of a labyrinthine hydrops.

"When medical therapy (histamine desensitization, the use of a sodium-free diet combined with the administration of ammonium chloride, or treatment with potassium chloride or with nicotinic acid) does not produce relief, a labyrinthotomy followed by coagulation of a limited portion of the membranous labyrinth offers a practically certain cure when the disease is confined to one side.

"The labyrinthotomy is a simpler operation than nerve section. The simplest form is accomplished by making a fenestra through the bony wall of the horizontal semicircular canal. If this is followed by mild and limited coagulation of the membranous labyrinth, the symptoms of Meniere's disease are controlled and there is a possibility of preserving some hearing.

Five cases operated upon by the method of Day are reported. Relief from the attacks of vertigo was obtained in each case."