

PETERSON (R.)

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FELLOW AMERICAN ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS.

(Read by invitation before the Grand Rapids Dental Society, February 13, 1895, and reprinted from the DENTAL COSMOS for April, 1895.)



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ARE the teeth more liable to become carious during pregnancy? It will be noticed that I begin this paper, which I have had the honor of being asked to prepare for your society, with a question. This is appropriate, for it is in this spirit that I desire to bring the subject before you. As it has not been within my province to make a critical examination of teeth affected with caries, it is evident that I must depend for my facts in regard to this disease upon the members of the dental profession. I find that the literature upon this subject is voluminous, and that not only has its course been accurately described, but also that many important discoveries have been made during the past few years which tend to make its etiology more clear.

I find also that the condition of pregnancy has been most carefully studied and all its phenomena thoroughly discussed. But when I endeavor to discover some recorded observations upon the subject which will occupy our attention this evening, I meet with a disappointment, for, although I have carefully searched both the "Index Catalogue" and the "Index Medicus," I can find but little that has been written upon the relationship existing between pregnancy and dental caries. What little I have discovered has been in the form of short sentences, scattered through the different articles, and especially aggravating because of their brevity and assumption of the reality of certain conditions which are far from being proved. This proof must be furnished by the dental surgeons and not by general practitioners; and if I shall by this paper arouse you to an increasing interest in caries affecting the pregnant female, so that you may discover some of the missing links in the chain of evidence, I shall feel more than satisfied.

There is little reason to question the probable correctness of the opinion generally held, that the teeth are more liable to become carious during pregnancy. I am unable, however, to find any collected statistics upon the subject. I do not see why such observations should not be made and recorded, and the question settled beyond dispute. Surely, if an accurate history be taken of patients who seek your advice because of caries rapidly developing during the pregnant condition, you soon would be possessed of sufficient data to scientifically demonstrate the truth of the opinion which is almost universally held. But inasmuch as I am unable to find such records,



I must assume, at least for the purpose of this paper, that pregnancy does have some influence in the production of dental caries.

The attempt to explain the nature of this influence is the task that is imposed upon me this evening. And in order that this may be done in an intelligent manner, I must ask that you bear with me while I briefly outline the salient features of dental caries, at the same time excusing any inaccuracies in one who must necessarily glean his facts from the literature of the subject, and not from daily observations of clinical material.

To the general practitioner, and especially to the surgeon, nothing can be more proven than the chemico-parasitic theory of caries, of which Dr. Miller, of Berlin, is the principal exponent. This careful investigator has applied the rules laid down by Koch for the study of pathogenic organisms, and has demonstrated that under certain conditions there exists in the human mouth a living ferment capable of self-reproduction (Robert Ormiston, M.D., *DENTAL COSMOS*, vol. xxx, 1889); that this ferment produces an acid at the point of contact with the tooth, capable of dissolving lime-salts. It was also shown that this was lactic acid, and that the micro-organisms were anaërobic, and therefore could live and thrive deep down in the carious mass. (G. V. Black, "American System of Dentistry," vol. i, page 761.) In some fissure of the enamel not washed by the saliva, and thus giving a chance for the lodgment of food, the micro-organism begins its work. The acid is produced and the hard enamel decalcified, and the softer dentine within exposed. By means of the dentinal tubules the micro-organisms gain an easy access to the interior of the dentine. The tubules are packed full, and more lactic acid is produced and more decalcification follows, until the carious cavity is produced. Because of the ramification of the tubules just beneath the enamel, there is a marked tendency to decalcification from the action of an acid devoid of the presence of micro-organisms. The fact that the tubules are not widened is one among other proofs which go to show that bacteria are at the bottom of the carious process.

This, in brief, is the modern theory of dental caries. It relegates to the past all the other theories, which had for their foundation a purely chemical basis, or sought to explain the phenomena through the agency of a vital process having its origin within the pulp-cavity.

This being the case, how are we to explain our first proposition,—namely, that pregnancy exerts a marked influence upon caries of the teeth? It is evident that the increased frequency with which caries is met with in pregnant patients must be due:

1. To influences which make themselves felt primarily upon the interior of the tooth; or
2. To influences acting primarily upon the external surfaces of the tooth; or
3. To influences which are directed at the same time both upon the external and internal surfaces.

1. *Influences which make themselves felt primarily upon the interior of the tooth.*

I shall not weary you with any description of the theories which have been advanced to explain the etiology of dental caries, all of them based upon the idea that it was inflammatory in its nature and started

from within. I shall simply examine two of the theories which are advanced at the present day to explain the cause of dental caries occurring during pregnancy. The first is one most commonly accepted as the explanation of the phenomena we are considering. It is, that the lime-salts are abstracted from the tooth in order to supply the demands of the growing fetus. I am unable to see why such a theory should be so universally accepted, for I am unable to find one scientific fact which can be brought forward in its support. In the absence of any microscopical examinations of the teeth during pregnancy for the purpose of ascertaining if an absorption of lime-salts is taking place, we are forced to consider the question more or less theoretically. If I am correct in my histology, the teeth are not supplied with any system of absorbents whereby the lime-salts can be abstracted for the purposes named. (Barrett, *Dental Practitioner*, vol. xxiv, April, 1893.) How, then, are they to be carried to the fetus from the tooth? The absence of any conveyance is certainly a serious drawback to any theory of the transportation of lime-salts.

For evident reasons, the teeth, of all the tissues in the body, are least liable to undergo the changes dependent upon nutrition. If this were not so, a few months of low diet would leave the hungry person without suitable teeth to masticate the much-desired food when obtained. If it were necessary to rob Peter to pay Paul, and abstract from the osseous system of the mother enough lime-salts to supply the needs of the fetus, why should the teeth be chosen? Why should not the bones, which are supplied with absorbent vessels, be selected for the sacrifice? But there are no evidences that these latter are affected in the way it is claimed the teeth are.

The endeavor has been made to show an analogy between osteomalacia and dental caries. At the first glance the two diseases have points of similarity. Pregnancy exerts a marked influence over both, the majority of cases of osteomalacia occurring during gestation. In both there is a loss of lime-salts. But microscopic examination of diseased structures in osteomalacia has shown that at some stages it is a true inflammation, which cannot be said of caries. Dr. George Dock, in a case of the former reported before the American Association of Physicians (Transactions, 1894), says that the bacteriological origin of the disease must be given up, as it is without foundation. His explanation of the cause is that it is a tropho-neurosis. In a private communication he states that the difference in the two diseases lies in the fact that dental caries is due to the action of micro-organisms, while some other explanation must be sought for the origin of osteomalacia. I fail, moreover, to find any mention of the teeth being affected in the latter disease. I think, however, that there is another condition present in both diseases which is etiologically very important. I shall mention this later on.

The theory which has been advanced to explain the supposed withdrawal of the lime-salts from the tooth is, that just enough phosphates are taken into the system during pregnancy to supply the needs of the fetus, and that the natural waste of lime-salts of the tooth is not replaced, and hence the tooth suffers in the loss of its inorganic elements. This, to my mind, is a much more plausible theory than the first one considered, in that it does not deliberately

make a freebooter of Dame Nature in charging her with robbing the tooth of its stored-up treasure. There is probably more or less waste and repair going on in the tooth all the time, and in the absence of known facts regarding the quantity of these products, it would be within the range of possibility for the tooth to become impoverished were the supply of phosphates not sufficient. But here is the weak point in the theory. I find the following statement in the editorial article quoted above (Barrett, *Dental Practitioner*, vol. xxiv, April, 1893), the accuracy of which I cannot vouch for, as the references are not given: "The following computation has been made: If rice flour, which contains as little of the phosphates as any other common food, were the sole nutrition of a pregnant woman, and if she consumed barely enough to maintain a healthy existence, she might obtain from that alone double the amount that would be needed for herself and the growing child. It is well known that women always excrete phosphates during gestation." That the mother's organism is sufficiently supplied with lime-salts during pregnancy, it would seem as if there were normally the excess mentioned above, if we consider that osteophytes are found in the inner surfaces of the calvaria and even in the pelvic bones. They have been found to exist in over one-half the cases of women dying after the fifth month of pregnancy. (Jaggard, *Am. Sys. Obst.*, vol. i, p. 350.)

2. *Influences acting primarily upon the external surfaces of the teeth.*

I believe that it is much more rational to endeavor to explain the influences of pregnancy upon dental caries by directing our study to the changes in the secretions of the oral cavity which may arise during gestation. If we can show that these secretions become more acid during this period, we will have made a considerable advance in our investigation of the subject under consideration. For acid secretions will evidently furnish the most assistance to the entrance of the micro-organisms into the interior of the teeth, by causing a decalcification of the enamel, or furnishing a soil suitable to the rapid development of the bacteria. I am unable to find that the oral secretions have been tested in relation to their acidity during the pregnant condition. Such a series of examinations should be made, and would prove of great value in solving the problem before us. But there is considerable probability that such a condition does exist. We must look to the changes in the blood for an explanation of the phenomena. These changes have been carefully studied and are well known to you all, and need not be enumerated. There is every reason to believe, however, that besides the increase in white corpuscles, fibrin, and water, there is a decided diminution in the alkalinity of the blood. In an important article ("Lithiasis in Pregnancy," *Jour. Am. Med. Assn.*, 1887, vol. ix, No. 23), Dr. J. E. Kelly seeks to ascribe this condition of the blood to the influence of lithemia upon the maternal organism. The similarity between the symptoms produced by the lithemic condition and those accompanying pregnancy are certainly striking, and have been set forth by the writer in a masterly manner. Of so much importance do I consider this article, as offering an explanation of the increased acidity of the secretions of the mouth, that I will quote the last paragraph

of the paper entire: "As in the *résumé* of lithiasis, I wish to recall the persistent effects upon the system caused by the occurrence of a single pregnancy which, manifesting themselves by various lesions not to be ascribed to any other influence, and indicating the permanent adoption by the constitution of a morbid action, which must be regarded as being closely related to lithiasis. In endeavoring to establish a parallel, if not an identity, between the constitutional tendency produced by lithiasis and pregnancy, I have indicated that both originate in a grave disturbance of nutrition; they present a similar modification of the blood; the pathological changes bear a close resemblance; the prominent functional disturbances are broadly identical; the numerous sequelæ are similar; and lastly, after one or more visitations, the constitution is prone to adopt the induced condition as a diathesis."

The disease gingivitis is well known to you all. Here it is a well-proven fact that the saliva is extremely acid. I understand also that this disease is more prevalent, and of greater severity, in persons of a rheumatic or gouty diathesis. These diseases are characterized by excess of uric acid in the system and a diminution of alkalinity of the blood.

It is here that I would call attention once more to osteomalacia. Senator, in speaking of this disease (Ziemssen's *Cyclopedia*, vol. xvi, p. 221), says, "It (diminished alkalinity of the blood) might result from the hyperæmic state of the marrow of the bones, which (as I have pointed out in speaking of rickets) may resemble the splenic tissue to which it is closely allied, in being proved to generate an excess of certain organic acids when in a state of irritation (*e.g.*, in leukemia.)" It is agreed that pregnancy is an essential factor in the production of this disease, although the exact manner in which it acts has not been discovered. It is not too much to expect that further investigations will throw more light upon this very obscure subject, and possibly aid us in understanding why there is a diminished alkalinity of the blood and an increase of the acid secretions during gestation. I doubt very much whether this position is tenable. It is probable that the acid by itself is too weak to act upon the enamel, and could only therefore aid by rendering the saliva still more acid, and more favorable to the subsequent action of the micro-organisms. Nature has taken precautions to guard the teeth against the temporary action of acids, by causing an increased flow of alkaline saliva, which neutralizes or washes away the acid which has entered the oral cavity. If it were not for this provision, the teeth would necessarily suffer more than they now do. If it be true, as we suspect, that the saliva in pregnancy is abnormally acid, then much of its neutralizing action would be lost, and the acids contained in the vomitus might do more injury than would be possible under ordinary circumstances. Still, my opinion is that the effect is but slight.

Another explanation for the increased frequency of caries during the pregnant condition has been offered by assuming that during this period the tooth-brush is called into play less frequently, and hence the teeth decay from neglect. I only mention this as a fair sample of a number of theories I have met with in reviewing the literature of the subject, and not because I consider it of great value as throwing light upon the etiology of the disease under consideration. Preg-

nancy occurs at an age when habits in regard to personal cleanliness have become established, and the woman either customarily cleanses her teeth or neglects it altogether, as the case may be. If pregnancy were to have any effect, it would act as an incentive to the use of the tooth-brush, because of the bad taste in the mouth, which is well known to exist at such times. It will be unnecessary to take up the third proposition in regard to the cause of pregnancy, as it has already been discussed when considering the other two.

I have purposely avoided any mention of treatment, as it has not been my intention to take up that portion of the subject, and because it really is unnecessary. If the proposition I have advanced this evening be correct, and if the frequency with which dental caries is met with during pregnancy be due to some condition of the blood, which in turn causes some changes in the composition of the secretions of the mouth, whereby a better habitat is offered for the growth of the destructive micro-organisms, then it necessarily will follow that the treatment for such a condition will naturally fall upon the family physician. It certainly would be interesting to watch the effect of treatment directed along this line, and to ascertain if an anti-lithemic treatment would be productive of favorable results. It seems to me that such medication is indicated as much as that which is more commonly used, as for example the administration of some form of lime-salts. The local treatment of the condition we have been studying, it is unnecessary to say, will fall naturally to the family dentist, and will be treated with his customary skill, and will be productive of the usual happy results.

SUMMARY.

1. It is probably true that dental caries is more liable to occur during pregnancy.
2. Dental caries is a disease characterized by a molecular disintegration of the normal constituents of the teeth.
3. The disease is caused by the action of certain pathogenic micro-organisms which produce lactic acid, which in turn decalcifies the enamel and exposes the dentine to the attacks of the bacteria.
4. It is improbable that lime-salts are abstracted from the teeth to supply the needs of the growing fetus.
5. More than enough phosphates are ingested to supply the needs of both mother and child, hence the maternal teeth do not suffer from lack of nutrition.
6. During gestation, osteophytes are found, showing an excess of lime-salts in the system.
7. The true explanation must be looked for in some change in the oral secretions, which thereby furnish a more favorable soil for the development of the micro-organisms.
8. There is evidence to prove that the saliva is more acid during pregnancy.
9. This condition is probably due to changes in the blood, whereby its alkalinity is diminished.
10. The analogy between this and the lithemic condition is striking.
11. Vomiting of pregnancy, while it may to some extent aid, cannot be considered a potent factor in the production of caries.
12. Neglect of the teeth during pregnancy cannot be proved to be more prevalent than at other times, and therefore should not be considered among the causes of caries.

