

# THE TREATMENT OF ROOT CANALS WITH PUTRESCENT PULPS.

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(Read before the Washington State Dental Society.)

IT IS indeed with a great deal of pleasure that I appear before you to discuss the various phases of root canal work. While I have devoted a great deal of thought and some investigations to roots of teeth, I must confess that the precise facts which I shall be able to present will not be sufficient to give you a comprehensive knowledge of the whole subject. There are, however, some facts regarding certain pathological conditions, which I wish to present to you and that have caused me to take a positive position regarding the management of these cases.

The process in the breaking up of the pulp tissue by bacteria may be divided into two classes; the putrefaction of the protied, or the albuminous tissue, and the fermentation of the carbohydrates, or non-albuminous tissue. As a result of this process the elements composing the pulp tissue are set free and unite chemically with each other to form certain products, and again these products unite with one another to form the by-products when decomposition is complete.

In the greatest per cent of cases which we are called upon to treat, I do not believe decomposition is complete. During this stage there are albuminous substances present which are undoubtedly saturated with bacteria. To know the character of the products present in the pulp chamber may appear to some to be of but little value. I wish to state, however, that such knowledge is of the

greatest importance if the most satisfactory results are to be obtained in the treating of septic root canals. Substances present in these canals may be liquid or a semiliquid which we can safely assume is filled with bacteria. The only means by which the bacteria in these broken up tissues can be reached is to employ an agent that will mix with the fluid present. A remedy that is not missable with water is contraindicated in the treatment of these cases.

Whether decomposition is complete or not there are present during this process certain products resulting from the breaking up of the pulp tissue. These are chiefly ammonium compounds. The media can never be of the acid nature for any length of time at least. It would perhaps be possible for such a media to be produced during certain stages of decomposition, but it could not remain so because the acid would at once become neutralized by the calcium salts present in the tooth structure. It is, however, possible for the media to be neutral at times, but as there are good reasons to believe that it is alkaline, we will assume it to be of such a character, and base the selection of the ingredients for the remedy to be used, upon this supposition.

If the media present is of an alkaline nature the ingredients of the remedy to be used must possess properties that will act chemically to transform these products. The agent which might first suggest itself would be an acid to neutral-

ize this media, but the difficulty in employing acids would be that they would become neutralized by the calcium salts of the dentin. It is, therefore, necessary to select an agent that will not be acted upon by the tooth substance. I have selected chloral hydrate as one of the ingredients, because it shows a readiness to unite with a wide range of ammonium compound, also with sulphur compounds which are formed in the breaking up of the pulp tissue. It is also known that chloral hydrate possesses antiseptic properties and is readily soluble in water.

Thymol is another very good agent as it possesses powerful antiseptic properties. Both the thymol and chloral hydrate come in crystal form. By trichering equal weight of thymol and chloral hydrate in a warm mortar a liquid mixture is obtained. A few drops of alcohol should be added. This will aid in keeping the remedy in a liquid form. I have used this remedy for some years with gratifying results. The reports received from many other men who have used it for the treatment of putrescent pulps indicate that their results have been equally satisfactory.

The first step in all cases of root canal work is to obtain a radiograph of the teeth to be treated. Assuming this has been done and no rarified area was disclosed, but all findings indicate the case is a putrescent pulp, the next step is to apply the rubber dam, which has been previously sterilized. Now all the decay should be thoroly removed from the cavity. An effort to re-sterilize the rubber dam as well as the teeth themselves, by the application of tincture of iodine should be made and allowed to remain for a minute or two, when ethol alcohol should be used to wash off the iodine. This does not sterilize the tooth structure, but it may be of sufficient value to sterilize the surface infected material. I would not advise applying the dam to a great number of teeth in treatment. If

only a few teeth are isolated the chances for infection being introduced from the teeth will be greatly reduced.

I do not believe that the application of any germicide to the teeth can be regarded as an assurance that the teeth are sterilized, and for that reason I would avoid the risk of exposing more teeth than is necessary in treatments. I would also prevent as much as possible having any substance introduced into the canals coming in contact with the crowns of the teeth. Asepsis should be most carefully observed.

As to the sterilization of the hands, I doubt if this can be done satisfactorily. I prefer to have all substances that are introduced into the root canal sterile and use sterile instruments for handling them, and not allow the hands to come in contact with them at any time. I think such a method can be carried out more successfully than endeavoring to sterilize the hands. The general surgeon no longer believes that he can operate without the use of sterile gloves, and what cannot be accomplished in general surgery cannot be done in dental surgery. To use rubber gloves for dental operations would be impossible, but I do believe absolutely sterile operations can be done by the use of sterile instruments.

I would like to say something about sterilization before proceeding further. First one must be equipped with a suitable and efficient sterilizer. To my knowledge there is nothing in a dental sterilizer that is satisfactory. It is necessary to have a sterilizer so constructed that dressings and cotton can be sterilized by steam, and where by adjustment, the dressings can be dried. The sterilizer I employ was obtained from a surgical supply house. If a number of smooth broaches are wrapped with cotton before they are sterilized it will not be necessary to handle the cotton with the fingers. A small number of these can be wrapped in muslin and placed in a sterile jar until needed, thus avoiding

the risk of contamination. This suggestion was first made, I believe, by Dr. Miller a number of years ago. The objection he offered to this method was that the broaches became rusty and brittle after sterilization, but I have not experienced this, however. Where the broaches and cotton are thoroly dried I think this can be avoided. I do not use cotton in this way a great deal. I prefer the Johnson Cotton Points which can be sterilized in the same manner. This method of sterilization is very simple and can be carried out in any dental office. A simple efficient method is always more valuable than the elaborate ones which require additional assistance and expense to maintain.

Great care should always be exercised in opening root canals or placing in the remedy. A slight pressure might cause some of the bacteria in the septic canals to be forced thru the foramen, producing an infection. I do not believe it is advisable to attempt to enter canals to any extent, at least at this sitting. I prefer to dry out the canal as much as possible and to place a pellet of cotton saturated with a thymol and chloral hydrate mixture, in the pulp chamber. Then place sufficient temporary stopping over the dressing to cover it, but do not fill the entire pulp chamber. The purpose of this is to make it possible to hermetically seal the cavity. In order to accomplish this, however, a pellet of cotton saturated in chloroform should be wiped over the stopping in the cavity. The chloroform dissolves enough of the gutta percha to seal the cavity. By the use of compressed air, remove the excess chloroform.

The temporary stopping will not be sufficiently stiff to withstand the stress of mastication, therefore, the cavity should be filled with a cement that can be easily removed. The cement will not seal the cavity sufficiently tight to exclude moisture, but it is used to prevent pressure caused by mastication from forcing substances thru the apex. This

treatment should remain three or four days. It can, however, be left a week with safety, if for any reason it is found necessary.

At the second sitting, after the rubber dam has been applied, the sterilization of the teeth and rubber dam by the same process suggested for the first sitting should be employed. At this time all instruments should be absolutely sterile. If it is necessary to use burs they should also be sterile. If the chip blower is used the air should be drawn from the flame of the Bunson Burner. At this time some effort should be made to cleanse the canals with a sterile bar broach, but no attempt should be made to reach the apex. The debris should not be removed from the broach with the fingers. If the shallow dish containing peroxide is employed to place the end of the broach in, it will be fairly well cleansed by the action of this agent upon the putrescent material. The broach should now be placed in a small dish containing phenol and then in alcohol to neutralize the phenol. This will maintain a clean broach at all times. After the canals have been fairly well cleansed, flood the pulp chamber with alcohol. Dry with hot air. There are three reasons for using alcohol at this time. The first is for further sterilization, the second for assisting in drying the canals thoroly before the application of the remedy is made, as moisture tends to dilute the remedy which would reduce its efficiency; and the third reason is, that the bacteria will be deprived of some of its media by removing the moisture. I regard this procedure a very important step in the treatment of septic root canals.

I then insert a Johnson Cotton Point of the suitable size, soaked in the remedy, into each canal, and if the points are not of a satisfactory size, I use sterile cotton from one of the broaches prepared by the method described above,

and again seal as was done at the first sitting.

At the third sitting an effort should be made to thoroly cleanse the canals after the rubber dam has been applied. It will be impossible to remove all the broken-up pulp tissue by the use of broaches. A very convenient and efficient method for accomplishing this, is by the use of sodium and potassium. This alloy, as you know, is contained in small tubes. A small portion should be placed in the pulp chamber with a smooth broach and worked gently into the root canals, but great care should be exercised to prevent any of the remedy from passing thru the foramen. It will be observed that a violent reaction often takes place when it comes in contact with moisture. This is due to the action of the metals upon the water liberating hydrogen which again unites with oxygen in the air, producing water.

Another chemical process involved by the action of these metals is the transformation of the pulp tissue into soap, which, as you know, is soluble in water and can, thereby, be readily removed from the canals by the use of sterile water. However, if more convenient, dioxogen can be used for washing out the canals. Great care should be exercised in approaching the apex with sodium and potassium as very serious results can occur from the action of these substances when they come in contact with the peridental membrane. Sodium and potassium should never be used where there is any possibility of it passing thru the foramen. The results of this action will be shown in my presentation this evening. These experiments were undertaken upon dogs for the purpose of ascertaining if sodium-potassium would destroy fragments of vital pulp tissue that might remain adhering to the sides of the canals after the removal of vital pulps. Much to my surprise I found the membrane highly inflamed.

If the indications are favorable at this

time, I think an effort should be made to open the root canals. I do not mean by this, however, that an opening to the apex or thru the apex should be made by the decalcification of the tooth structure by the use of acids, as is being advocated by most root canal workers. I venture to say that thru the employment of this method the percentage of abscesses will be greatly increased owing to the destruction of the peridental membrane by the action of acids employed. I am most positively opposed to such a method. However, if an opening to the apex exists, by all means fill the canal to the end. First, try to determine how many canals exist. Do not work on the supposition that each root has only one canal. I have seen a cuspid with two distinct root canals extending from the pulp chamber to the root end.

If there is any difficulty in entering the canals, place hydrochloric acid, 50% C. P. in the pulp chamber and work it into each canal with a fine, smooth broach. So often it is found that secondary dentin has formed in the upper portion of the root canals, especially in molars and bicuspid teeth of middle life or advanced age, but in the teeth of children this is found lacking. Such tooth structure readily gives way to the action of acids. The products formed should be washed out but I do not see the necessity of using any substances to neutralize the acid as the calcium salts of the tooth will neutralize the acid. However, if there should be a great amount of acid placed in the apical portion of a canal having a large foramen, such a procedure would, of course, be advisable.

I hope I am not going to be misunderstood by taking the stand in opposition to the technic for making openings in root canals to the apex. To me, it appears that only a perforation of the root is made by this method. I cannot conceive of how any good can result

from such an operation and when only one canal is opened and filled where there are a number of canals in the same root left unfilled. For instance, in some of the teeth that were shown today there were six or seven openings at the apex. If only one of these canals is filled and the remainder are left open, of what value would this be, or if the object is to include the several canals in the one made by the use of acids, the tooth structure between these various canals would be destroyed. If this is done it will undoubtedly destroy the membrane covering this structure. Some maintain that only the tooth structure is destroyed by this process and the membrane left intact. It seems impossible to me to determine by any known means just how much acid will be required to decalcify the tooth substance, and if more than is required is placed in the canal, it will pass thru the root and come in contact with the membrane which will at once carbonize it.

I cannot conceive of how it would be possible to so govern the action of the acids that it will not act upon the peridental membrane in such operations. I am convinced this cannot be done. There may be those who believe the injury resulting from the destruction of the membrane would be of less consequence than the open root canal. I am not certain that a foramen exists in all roots. I am strongly inclined to believe it does not in all cases. However, my opinion is that the destruction of the membrane would invariably prove a failure to these operations. The full importance of a vital membrane does not appear to be generally recognized. When we recall that it has taken some years to enhance the proper interest in the conservation of the dental pulp, it is hardly to be expected that the profession would readily appreciate the value of the peridental membrane.

I will say this, however, if the opening to the apex exists, an effort should

be made to fill the apex, but I do not believe any attempt should be made to enlarge the foramen, for by so doing the peridental membrane at the orifice will surely be destroyed or injured to such an extent that it may become diseased.

It is impossible to determine when a canal is sterilized by any process unless a culture is taken, and as this seems hardly practical, I think one is justified in filling the canals as a rule, when no odor is perceptible. Altho I do prefer, in cases where there is any suspicion of odor, to seal in a mild antiseptic for a few days as a test to determine if the odor recurs. The remedy I employ in these cases is a ten per cent. solution of cresol in glycerine. If the odor does recur in the presence of this agent, it clearly indicates that the canals are not sterile. The former treatment should then be continued. The canals should never be filled if the seepage of serum persists to discharge from the apex. Such a condition indicates that a pathological condition exists in the periapical tissue. If all the conditions are favorable, I would fill the canals at this sitting.

I would like to say just a few words regarding the after treatment where pulps are removed. I do not believe immediate root filling should ever be done because it is impossible to control the hemorrhage following such an operation. It may be possible to control this to a certain extent by the use of a strigent, but there is likely to be a seepage of serum from the injured tissues, and if bacteria exists in the blood stream at this time, the bacteria will have an ideal culture media, and an infection will surely follow. I prefer to seal in a ten per cent. solution of cresol in glycerine.

There are two or three good reasons why a remedy of this nature should be used. First, because it will mix with water in all proportions. Try it. It will, therefore, mix with the serum or blood present in the canals to keep them

sterile. Second, it will not coagulate albuminous fluid; neither will it irritate the vital tissue where it may pass thru the foramen. For sealing the remedy in the canals the temporary stopping and cement should be used according to the method mentioned above.

Asepsis, in the strictest sense of the word should always be observed in these operations. I know some dentists seal formaldehyd mixtures in the canals after the removal of the pulp. No such agent is indicated here. If asepsis is employed there should not be any need for an antiseptic of any nature. I know that those who practice such a method would say they obtain perfect results by these means, and that if bacteria should be introduced in removing the pulp, it will be destroyed by the use of such agents. I will show by slides in the preceding paper what the effect is upon the membrane when used in this manner. We have in the past made serious mistakes by endeavoring to sterilize the infectious material introduced into root canals rather than employ asepsis. I am not certain that septic root canals can always be sterilized by the use of any agent. We have had evidence presented which shows that all septic root canals are not sterilized by the use of germicides. This statement is based upon results obtained from bacteriological tests. This work was done by Dr. Dahlgren of the University of Minnesota.

There are so many phases of this subject that I hardly know where to leave off. In conclusion, however, I would like to call attention to a few points regarding root amputation. Many are under the impression that these operations are very simple. If there are any who fail to realize that these operations require the utmost skill and care, I believe I am safe in predicting that by far the greatest percentage of cases in their hands will be failures.

There are so many conditions to be

reckoned with in these cases, that it will not be possible for me to enter into the subject fully in this discussion. I will endeavor to call attention to only the most important points.

To operate upon all roots regardless of the size of the abscess without taking into consideration the physical condition of the patient would prove most disastrous to these operations. I believe that if we learn the results of the work that has been done, root amputation will be regarded as a complete failure.

I do not wish to have you gain the impression, however, that I am going to offer a technic where it will be possible for you to operate successfully in all cases. Even with the utmost care in the selection of my cases, I have failures, but I also have some successful operations. I do not believe it is possible to estimate as yet, the percentage of failures.

One important point that should be remembered in all these operations is to always remove all of the root involved in the abscess; in other words, remove all of the root which has been denuded of its membrane by the presence of the infection. If this is not most closely adhered to the abscess will invariably recur.

The first question to be considered is whether or not the patient's recuperative powers are sufficient to restore the tissues that are destroyed by the infection and sacrificed in the operation. To determine this, of course, requires some experience. I can tell you only in a general way how this can be determined. It is never wise to operate upon bed patients, that is, patients who are confined to the bed on account of lesions produced by infections. There are times when a patient is not in bed when you are convinced they should be. This, of course, applies to these cases.

If there are several roots requiring amputations for one patient suffering from secondary infections, I do not be-

lieve that it is wise to operate upon all these teeth at one time, or perhaps it would be better to operate only upon the smallest infections and extract the rest of the teeth. I prefer doing this in most cases. It will be found that if a great number of amputations are done at one time, it will, as a rule, be more than the patient can endure. There is invariably some swelling and soreness after these operations. I do not believe more than one or two, at the most, should ever be operated upon at one sitting. I have, in several cases, operated upon many teeth

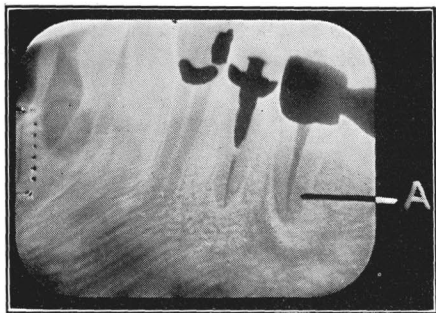


Figure 1.

at one time under ether anesthesia, but I cannot recommend this method when the risk of the anesthetic and the extreme soreness, as well as the systemic disturbance which invariably occurs as a reaction, is considered.

The systemic disturbance usually manifests itself by increasing the severity of the lesion or lesions in evidence before treatment was undertaken. That is, if rheumatism has developed from a focal infection, the rheumatism becomes worse. If a heart lesion exists this condition becomes decidedly worse. If too much work is undertaken at one time it can be seen that where heart lesions have resulted from these infections, that this may prove fatal.

I cannot at this time describe fully the technic for these operations. There are, however, some points in the technic

that I feel will bear special emphasis. In all of these operations I am convinced that the root should always be amputated gingivally from the rarefied area, as indicated by (A) in Figure 1. The membrane of the roots involved by the abscess will be found to be destroyed and no portion of such a root should be allowed to remain, for it will continue to be a source of irritation which will invariably result in the formation of an abscess. It will, of course, be impossible to determine this point before entering the root thru the bone. In all cases I endeavor to enter above such a point and cut gingivally after the amputation has been made if it is found necessary.

It is usually a simple matter to determine when all this area has been removed. I might mention, however, that where such a condition exists, the point of a fine explorer can be passed into the area existing between the root and the process.

Another condition which I would like to call attention to is the sinuses often formed in the medullary cavity where medulla has been destroyed by the existence of pus. I have entered such sinuses with the explorer and found pus discharging very freely. Upon investigation it will sometimes be discovered that another infection exists beyond this sinus in the medulla some distance from the main abscess. Such conditions are not revealed by the radiograph. I believe all abscesses are progressive; that is, they continue to enlarge and it is, I believe by this process that it is accomplished. If such infections are overlooked the systemic results may not be very satisfactory for such abscesses may remain and continue the secondary infection. One must constantly bear in mind that thoroughness is the secret of success in mouth infection.

Where the abscessed area involves one-fourth of the root or where it will be necessary to remove one-fourth of the end of the root, I do not believe an am-

putation should be undertaken, or at least success should not be expected in such cases. There are two reasons for this failure. A re-infection from the infectious material entering the dentinal tubuli of the tooth structure owing to the great area of infectious material existing in such cases the dentinal tubuli would naturally become saturated with bacte-

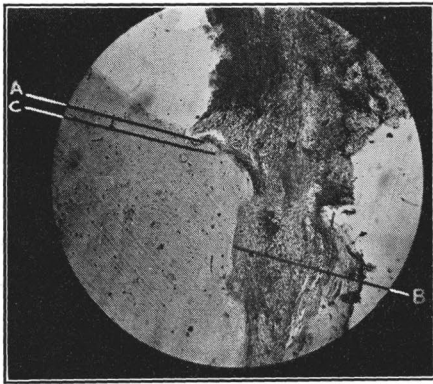


Figure 2.

ria, and the second reason is because of the irritation caused by the movement of the tooth.

In my work upon dogs I have tried root amputations, but as it became necessary to kill the dog three months after the operation, the results were not of much value. I did, however, have some slides made and I have an enlarged photomicrograph that I wish to explain.

Figure 2. A indicates the point where the root was cut off, B the labial surface, C shows osteoclasts. From the labial surface up to the point where the osteoclasts are shown there is a dense substance formed over the end of the root. This is, I believe, a new layer of cementum. However, the substance has not developed sufficiently for me to determine positively. It will be observed that the fibers of the tissue overlying the end of the root tend to run across the root, where above this point the fibers lie parallel with the long axes of the root. At B it will be observed there is a dipping in of the cementum. This is due, I believe, to the accidental removal of this portion of the cementum during the operation. There is a continuance of this cementum with the substance found over the end of the root that is amputated. While I did produce abscesses which remained for about fourteen days before the operation, it is possible that the protoplasm in dentinal tubuli remained vital or partially so at least, which would make the condition in this experiment materially different from those formed when the infection has existed for a number of years as is the case in many of the roots met with in practice.

I am strongly of the opinion that unless cementum and a peridental membrane does form to cover the end of these roots, that operations of this nature will prove a failure so far as a permanent success goes.