A CONSIDERATION OF THE RELATIVE USEFULNESS OF "FIXED" AND "REMOVABLE" BRIDGE-WORK.

By Hart J. Goslee, B.S., D.D.S., Chicago, Illinois.

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HOWEVER much or little consideration may have been given to the teeth of mammal thruout all the ages, their functional importance is now becoming fully and generally recognized, and while the growth of this recognition may have been slow, it has nevertheless been gradual and certain.

Hence, dentistry, as a preventive measure, and as an important specialty of the healing art, while yet perhaps only in its infancy, and far from being a definite science, and whilst its practice may still be clothed in empiricism, is fundamentally the outgrowth of necessity, and therefore no longer to be regarded as a luxury.

The wonderful and mystifying ingenuity of the Creator placed teeth in the mouths of mammal for a definite and specific purpose, and so designed and arranged them, originally, as to fully meet all of the requirements of the part which they were to play in life and in health.

Had the mammal hewn closely to the mode of life originally intended, it is probable that the science and art of dentistry might have remained unknown and unheard of in the scheme of life, but since, in the evolution of the specie, the influences of habit and environment have produced or brought about a continuous series of progressive changes, the teeth have not been immune to those variations and susceptibilities which result in disease, deterioration, disintegration and impaired or lost function.

In the original plan it is evident that a full complement of teeth was regarded as being essential to health and to longevity, and that such was designed and intended to endure. But, as a result of these influences, this wonderful mechanism has likewise become subject to all of the destructive processes which devastate and undermine *health*, and in consequence premature loss, in part or in whole, not infrequently follows.

A premature loss of any one single unit in the mechanism of the masticatory apparatus must be recognized as meaning or at least inviting, impaired function to a greater or less extent, and as impaired function increases in direct proportion to the number of units thus lost, the requirements of health and of efficiency will demand, and can only obtain from, a replacement of the missing units, in part or in whole, until the coefficient and maximum of normal functional activity shall have been restored.

It is therefore apparent that the loss of natural teeth, whether this loss may be premature or whether it may result from the ravages of time and usage, is a serious matter, and that in all efforts directed toward the promotion and safeguarding of health two highly important considerations present to the dentist: *First*, the conservation of the teeth; and, *second*, their replacement when lost.

With regard to conservation, permit me to say, first, and will all of the emphasis at my command, that every

single natural tooth possesses an intrinsic value in, and to, the human economy, which far exceeds any possible value of an artificial substitute of whatever kind or type, or however skilfully it may be made or applied.

Hence, it is and must always be the first duty of the dentist to save the natural teeth, and in so far as it may be possible to so teach and inculcate in the mind of his patient the signal thought that no effort on his part, or no effort within the scope of his artistic possibilities, will ever enable him to improve upon normal conditions, or to furnish substitutes which will in every way take the place and do the work of the natural teeth.

But until this is more keenly recognized teeth will be lost, and so long as teeth are lost, they must be replaced, and when they must be replaced, the second duty of the dentist must necessarily be to effect their replacement in the best possible manner.

While it is true that the early efforts in the replacement of lost teeth were probably made more particularly for the purpose of relieving disfigurement, with its attending embarrassment, yet a recognition of the importance of also, and at the same time, restoring usefulness and efficiency soon followed, and for both purposes combined a demand, growing and increasing with time, resulted in the advent of the mechanical or prosthetic aspect of modern dentistry, and later of what is now designated as the specialty of crown and bridge-work.

Prior to the advent of this specialty, missing teeth were supplied by means of partial dentures, made, first, by swaging a base of gold or of silver, and attaching the teeth to it by soldering. Later, vulcanite rubber was introduced, and because of the greater simplicity and economy involved, its use soon practically supplanted metal bases, and became the general practice.

In the absence of a better method,

this means of supplying missing teeth served the purpose, and was for many years, and is still, a more or less satisfactory procedure. Indeed, had such a practice continued, it is probable that many thousands of good, sound natural teeth, long since lost, would still be doing good service.

And yet, apparently satisfactory as was this method, in the main, and irrespective of the fact that no product of art can ever entirely and completely take the place of nature, objectionable features were observed.

The free mobility and easy displacement of such fixtures did not afford great efficiency, and hence they served the purpose of cosmetics rather than the requirements of actual usefulness, and a greater or less degree of injury to the necks of the remaining natural teeth, and the contiguous tissues, as a result of contact and attrition was noticeable.

While viewed more or less lightly by both dentist and patient for many years, these objectionable features were nevertheless well founded. They were well founded for the reason that just in proportion as the body of the sustaining fixture which supplies missing teeth is easily movable, is the actual masticatory efficiency of the artificial substitutes correspondingly decreased; and, also, just in proportion as the fixture is supported entirely by the soft tissues upon which it rests, will some degree of resorption of these tissues be constantly stimulated, and will the contact of the base with the necks of the remaining natural teeth prove a source of greater or less and of increasing injury to the health and life of these teeth.

Hence, it is not at all surprising that some effort to overcome these objections, and to improve upon this method, should follow, and such an effort resulted in, and marked the advent of, that mode of procedure which is now designated as "fixed" bridge-work.

The replacement of missing teeth in a

fixed manner seemed at once to afford relief from these objectionable features, and therefore to mark the advent of a new era in constructive procedures, and as a result fixed bridge-work has been recognized by leading teachers, authors and practitioners as a sane and useful, tho much abused, practice now for more than two generations.

In the original conception and application of fixed bridge-work, however, the practice was limited to supplying but a single missing tooth by means of attaching it securely to one or more adjacent natural teeth, and as this simple procedure seemed to afford and insure success and permanency to a marked degree, the replacement of a greater number of missing teeth by the same means, and in the same manner, soon, and perhaps quite naturally, followed.

And as the possible advantages to be thus obtained were recognized by both dentist and patient, the practice of fixed bridge-work became more and more popular, and more and more general, and in proportion as it seemed to be a successful procedure in small cases, it increased in popularity and in general usefulness.

In the same proportion, also, increased the courage of the dentist and the demands of the patient, until caution and precaution, reason and logic, mechanics and physics, and until any consideration of the physiology and pathology mayhap involved, and of the laws of hygiene and sanitation, and of health and disease, were either grossly abused or entirely ignored.

And thus the number of missing teeth which might be replaced in this manner increased from *one* to a *full complement*, and the practice of fixed bridge-work became more and more general, until finally the construction of a fixture which involved and included all of the teeth in the arch was looked upon by

the enthusiastic prosthodontist as his greatest operative achievement, and as an accomplishment which marked him as a skilled specialist in a wonderfully fertile field of human endeavor. And the patient, thus made a martyr to the brilliant evidence of the art and genius of the master, would proudly and unblushingly exhibit a masterpiece of “teeth without plates.”

But in proportion as the missing teeth thus supplied increased in number, it was soon observed that the proportion of failures also increased, and that the life of the fixture became of doubtful, or precarious, duration in the same ratio. Also, that mouths which had been so beautifully reconstructed were not often found to be healthy, and that when failure did occur, it was to be attributed in large measure to the fact that the supporting teeth, tired of their heroic struggle against the ravages of time and the burden of unnatural and unreasonable stress, finally succumbed and were easily removed, often still clinging fondly to their securely attached and perhaps beautifully made appendages.

No irony or facetious sophistry is intended, but thus and for these reasons the thought of “septic dentistry” was born, with *fixed bridge-work* as the parent to the thought, and a growing, vigorous, and sometimes vicious condemnation of fixed bridge-work, together with equally vehement demands for *removable* structures, has followed as a heritage.

While much of this condemnation has been justly warranted, for the reasons mentioned, still, in these days of advanced thought along the lines of preventive medicine and dentistry, certainly no one would or could fail to recognize the true value and importance of the laws of hygiene and sanitation, or of any means which will in any way contribute to the conservation of health and efficiency, and therefore any method or any

practice which may produce or even invite a septic condition *should be* vigorously and religiously condemned. But is the failure of a large percentage of fixed bridge-work to subscribe to these laws due to a wrong principle, rather than to a faulty or injudicious application of a good and perhaps useful principle?

At the present time this question is agitating the profession to a considerable extent, and is one demanding our most careful and conscientious thought, for the reason that if fixed bridge-work is wrong in principle, and if its use necessarily means septic dentistry, then it must be abandoned as a practice; but if fixation is not altogether wrong in principle, and if a septic condition need not necessarily follow, then a place of usefulness in our practice must be accorded to it.

Readily granting that a large percentage of fixed bridge-work has been a failure from both physical and sanitary viewpoints; that much of this character of work which has not already failed perhaps will yet fail, and that many good, sound teeth have been lost, and perhaps will continue to be lost, as a result of its use, should it be universally condemned, or should effort be made to ascertain and, if possible, to overcome the cause of these failures?

From a physical viewpoint, it must be acknowledged that a very large proportion of all failures recorded has resulted from imposing too much undue and unnatural stress upon the supporting teeth. This is proven by the fact that smaller bridges have generally been more successful than larger ones, from the very beginning; but, granting that the permanency of the fixture is reduced by increasing its size, does it follow that fixation as a principle should be condemned?

It is also interesting to note that a large proportion of the failures from

the viewpoint of sanitation are to be found in the larger structures, but does this prove that ample and adequate sanitation may not be provided for in smaller fixtures? For the same reasons, should the septic contents of unfilled root-canals condemn the principles underlying the superstructure supported by teeth so treated, or mistreated; and will the presence of a fixed bridge induce or invite a condition of sepsis any more quickly or certainly than will an overhanging, unfinished cervical margin of a metal filling, or the edge of a poorly adapted artificial crown, or any other form of mechanical irritation?

In view of the fact that nature will not tolerate any form of irritation of a permanent character; that imperfect and faulty adaptation will produce irritation, with its sequela; and that such a condition may result from any one of many kinds of dental operations, is it fair to single out and shoulder the responsibilities for septic dentistry upon fixed bridge-work alone, or, at least, upon the underlying principle involved, rather than upon the possible devastating influences of injudicious application, or of faulty technic? I think not. Hence, notwithstanding the crusade of condemnation against the use of fixed bridge-work which has been prosecuted so vigorously ever since Hunter first called our attention to the frequent presence and undermining influence of septic dentistry, by the advocates of removable bridge-work; and, notwithstanding the fantastic claims made by some of these advocates, is it not possible, therefore, that there may still be a place for fixed bridge-work, and that it may possess some virtues and qualities which warrant its use, in certain cases, and under certain conditions?

And, further, whether a greater number of good, sound natural teeth have been lost by and thru the use and abuse of fixed bridge-work during all of

the years since its introduction than have been lost by the misapplication, or failure, of various attachments for sustaining removable structures in proportion; or than have been purposely sacrificed in the past few years by the over-enthusiastic followers of the foci of infection theory, is another question of debatable significance.

But be this as it may, the dentist of today is confronted with the fact that teeth are lost, and that when they are lost in order that function may be restored, health may be conserved, disfigurement may be relieved, and premature old age may be prevented, they must be replaced, and while it is admitted that no method of replacement will ever offer or afford a perfect restoration of the normal condition originally presenting, still an effort to obtain the greatest possible degree of usefulness, of comfort, of permanency, and of health, with the least possible injury to the remaining teeth and contiguous tissues should always be observed in their replacement.

With this signal thought in mind, and in justice to an honest conviction which is the product and result of experience and observation, I am compelled to believe that the principle of fixation, while not carrying out nature's original intentions, when properly and judiciously applied, is not altogether wrong; that septic conditions are not necessarily analogous to this particular method of supplying missing teeth, and that, in accomplishing the requirements of replacement and restoration to the highest degree, at least two important advantages may be obtained from the use of fixed bridge-work.

In the normal denture actual masticatory efficiency depends largely upon the stability of the teeth, and while each tooth possesses a slight range of mobility, due to the cushion-like action and elasticity of the pericemental tissues, that mobility is always and only in line with the direction in which stress is received,

but resistance to the stress of mastication is provided for by a close contact between the crowns of the teeth, and by their roots being surrounded with bone, both of which so stabilize them as to offer resistance to stress in proportion to their functional requirements.

This same stability in artificial teeth likewise increases their efficiency and usefulness, and this constitutes the first, and perhaps principal, advantage to be obtained from the use of fixed bridge-work.

And, secondly, the secure fixation of the supporting natural teeth, the stability and integrity of which may have become impaired because of the loss of contact, and of their tendency to gravitate, by means of a fixed structure, may often add increased stability, usefulness and longevity to such remaining natural teeth.

Were it not for these very important advantages, and were it not for the fact that small fixed bridges may be so constructed as to be kept as reasonably sanitary as it may be possible to keep the natural teeth, then the advocates of removable bridge-work, who claim that there is absolutely no place in dentistry for fixed bridge-work, would occupy a more reasonable and tenable position in the premises.

While many of the claims made for the advantages of removable structures are anatomically and physiologically sound, yet some of them are so radical that they are valueless, because no one line of mechanical procedure, no one system, no one method, or no one's individual ideas are so broad and comprehensive as to be universally applicable alike to all of the varying conditions which present in the treatment of normal and abnormal cases requiring the replacement of teeth.

For example, it is broadly claimed that since the natural teeth move in function, any fixed appliance which will in any way prevent this movement is

malpractice. That the teeth move in function has always been known. They always did, and always will, and no form or type of appliance, either fixed or removable, will overcome or prevent it.

It is true that when a fixed appliance involves teeth of different functional activities, such as the incisors, bicuspid and molars, that the normal individual movements are undoubtedly diminished, but whether to such an extent as would so interfere with the nourishment of the tooth as to cause its ultimate death and subsequent loss, or not, is doubtful.

In this connection, many teeth have undoubtedly been subjected to irreparable injury, and perhaps lost, thru the application of a fixed bridge, in which the principle of fixation itself was in no way responsible. This may come from the forcing to place of a structure which, because of a contraction or warpage taking place in the final assemblage of the parts, so draws or forces the roots of the supporting teeth into an abnormal position as to produce a degree of impingement upon the pericemental tissues, which ultimately results in stasis and death of these tissues. This is not an infrequent occurrence, and only one of many causes for failures which may result from the application of a fixture otherwise perfectly constructed, and which prove that faulty technic may be a factor in the failure of fixed structures quite as often as the failure may be attributed to wrong principle.

While faulty technic may also be the cause of many failures in removable bridge-work, yet by far the greater proportion occur as the result of the influences of misapplied leverage. These influences, however, are equally as injurious to the health and life and usefulness of teeth, irrespective of whether they support fixed or removable structures, and in the application of each, every effort to avoid, or at least to minimize, not only abnormal vertical

stress, but the influences of leverage as well, must be observed.

Hence, in fixed work no tooth used as an abutment must be permitted to become a lever, entirely unsupported and unprotected against the influences of abnormal stress, and in removable work the attachment to every tooth used as an abutment must be confined as nearly as possible within the periphery of the tooth for the same reason.

If these are recognized as the principal factors upon which the success of our work will depend, and if they are observed, then there must be a place for both fixed and removable bridge-work.

In fixed bridge-work the aim must be, therefore, to avoid or minimize unreasonably excessive abnormal stress; to group together as nearly as possible only teeth which have similar functional activities; to make an attachment to them which will insure sufficient integrity to withstand the stress imposed, and to make ample provision for the requirements of sanitation. When these combined factors may be correctly and favorably observed, then there is a place for fixed bridge-work, then its use is indicated, and then nothing will take its place and serve the purpose quite so well.

But when all of these requirements may not be observed, or may not be possible, then fixation is contraindicated, and a removable type of structure is demanded.

Realizing that my views would deal largely and more particularly with the practical side of this question, and desiring that the truly scientific aspect of the subject should also receive the consideration which its importance demands, I have asked that student of biology, and that mechanical genius, Dr. Calvin S. Case to supplement my views with his own ideas as to the physiology, possible pathology and mechanics involved in the application of fixed bridge-work. This he has done in the form of

a personal letter to me, which, because of its scientific value, I am now pleased to read:

Dr. Hart J. Goslee,
Chicago, Ill.

My dear Hart: The special phase of the subject of crown and bridge dentures of which you have asked me to give my opinion from a mechanical and physiologic standpoint, refers particularly to the relative movements of the abutment roots in their sockets under the forces of mastication, etc., and the influences which these movements exert toward breaking down the integrity and ultimate permanency of fixed bridge dentures.

In a consideration of this branch of the subject, it would be well to consider first the character and magnitude of the masticating forces which cause the normal movements of the roots of teeth in their sockets, permitted by the cushion-like elastic membranes which surround the roots and intervene between them and the walls of the alveoli, and whose function is doubtless partly to prevent the severe shocks of mastication, etc., from injuring the highly organized dental and pericemental membranes which are necessary for the nutrition and vitality of the teeth.

When we remember the exhaustive demonstration by Dr. G. V. Black showing the degree of force exerted by the jaws in mastication, (1) in direct pressure upon the teeth, and (2) against inclined facets of the cusps, and (3) in lateral raking movements of the mandible, we can begin to understand and appreciate the irresistible magnitude of these forces under which the teeth are so continuously subjected, with the production of almost every direction of root movement.

In regard to the need or absolute necessity of these movements from a physiologic standpoint for preserving the health and normal functional activities of the surrounding nutritive tissues, which has been made a point of argument by some writers against fixed bridge dentures, it is reasonable to believe that inasmuch as these same relative movements have been going on from the very biological beginning of human dental organisms, that they are quite as necessary as the mechanical stimulation of normal muscular movements are necessary, for the healthful functional possibilities of all the vital structures of which the muscles are composed. More-

over, the purely nutritive factors—the blood vessels and nerves—of the pericemental membranes are surrounded and interwoven with a network of elastic and fibrous tissue, undoubtedly for their protection against the shocks of mastication and mechanical root movements, which inevitably occur as a part of their existence. Whether or not these movements are necessary for the health and vitality of the root and socket membranes, is not the question; but what is important is the fact that no form of fixed bridge attachment can possibly stop these masticating root movements for any length of time.

It is important to remember in this connection that the main force of mastication is **direct pressure** upon the occlusal surfaces of the teeth, forcing the particular tooth or teeth, under action, deeper into their root sockets, to be followed immediately after the pressure is removed by a return to their normal positions, thru the resiliency of the pericemental membranes. This no doubt is true also of all lateral and distomesial root movements under normal conditions. Therefore, the claims of certain writers that fixed bridge dentures do not permit these physiologic movements, seems to me about as absurd as the cry that went up a few years ago by certain orthodontists, that fixed labial retainers do not permit the required relative root movements which normality demands. Whereas, the truth is that no dental appliance, however rigidly attached, can prevent the forces of mastication from moving the roots sufficiently in their sockets for all the purposes of healthful nutrition. Moreover, this retaining appliance referred to, is necessarily so delicate in its construction that it will yield slightly to the movements of the teeth; and furthermore, it is not intended for a permanent fixture as are bridge dentures.

If it is true that no dental fixtures can stop the normal root movements of mastication, it is certainly the most important consideration relative to fixed bridge dentures, because any character of attachment which rigidly binds one tooth to another, that is more or less distantly located from it, is bound to come under the unequal forceful strains of masticating movements which so frequently loosen and break down the most skillfully constructed fixtures, or produce other conditions equally disastrous.

If the piers of a two pier buccal bridge are close to each other, as in cases where a single artificial bicuspid is required,

there is lessened danger, because of the probability of a more equal distribution of the same direction of masticating force. Nevertheless, if one of these piers has a devitalized pulp with hypertrophied pericemental tissues, etc., the slight difference in its repeated and forceful movements, must in time result in disaster to a very large proportion of even these simple bridges.

If the forces of mastication were always up and down, or along the line of the axis of parallel roots that were equally solid in their sockets, and with an even distribution of force, there would be little danger to fixed bridge dentures however distant the piers are from each other. But unfortunately this rarely obtains.

The fact that every attachment of a fixed bridge to its pier is immovably constructed, means that in any inequality of the applied forces of mastication upon one side of the mouth, or the other, or upon the molar piers in relation to the front ones, the entire bridge structure, even to the very apical ends of the roots, must move in exact mechanical co-ordination as if it were one solid piece, whatever the unevenness of the strains.

Therefore, if the molar end of a fixed bridge upon one side is permitted and forced to move in a certain direction, and the adjoining cuspid pier, upon which the same masticating force is not applied is prevented from taking exactly the same relative movement, because of the length, direction or solidity of its socket attachments, etc., the inequality of the repeated strains upon the attachments must in time disrupt the most substantially constructed fittings.

From a mechanical standpoint, the fixed bridge dentures that are in the greatest danger are the buccal two pier, long span kind—say from a second molar to a cuspid—because of the mechanical advantages of the force which causes an unequal movement of the piers. For instance if the great force of mastication is repeatedly brought directly upon the molar pier, driving the roots ever so slightly into their sockets, with no equally directed force upon the cuspid, the strain upon the attachments of both piers will be increased in proportion to the amount of movement at the molar, and the length of span to the cuspid, which in this instance is the power arm of a lever.

To illustrate this, let us suppose that we have a rigid bar, bent at right angles at its ends, to form the posts and span

of a lower two pier buccal bridge solidly constructed, perfectly fitted and cemented in place. (Figure 1).

When masticating force is directed upon the center of this bridge intrusively, or linguo-buccally, there will be little danger to the bridge attachments because the entire bridge with its pier roots will move evenly in the direction of the force. But when the power is directed nearer upon one end than the other the danger to the attachments will be increased in proportion to the distance from the center of greatest resistance.

For instance if the masticating force is brought directly upon the molar causing an intrusive movement of this pier alone, the distal end of the bridge with its pier root will forcibly tend to move along the segment of a circle "a" whose center is at the cuspid attachment, "b".

The fact that the intrusive force upon

the molar pier tends to drive its roots directly into their sockets with diminished chance for the apical ends, "c" to move along the prescribed mechanical lines, will cause a great strain upon the molar attachment unless the apical ends are mesially inclined.

At the other end of this bridge, the strain upon the cuspid attachment is even more severe. The apical end of the cuspid root "d" must tend to move mesially along the segment of a much smaller circle "e" with a force proportional to the length of the span, and with a movement in proportion to the length of the cuspid root.

This mesial movement of the apical end of the cuspid root will be permitted, to a slight extent, by the yielding pericemental tissues. But if this is not fully in exact mechanical co-ordination with the movement of the molar, the integrity of the bridge attachments at this point must in time give way, because of the great mechanical advantage of this repeated forceful lever movement.

There is another root movement of the molar pier that is nearly, if not quite, as dangerous to the attachments, especi-

ally at the mesial end, of this fixed bridge. It is the bucco-lingual inclination or tipping movement of the molar caused principally by lateral movements of the mandible raking against the cusps, or sliding down inclined facets.

In considering this phase it would be well to cognize that all lateral movements of mastication, under normal conditions, produce inclination or tipping movements of the teeth, and never bodily movements. Moreover, the extent, ease, and possibilities of an inclination movement are increased over that of a bodily movement, by the fact that the force exerted in the socket (Figure 2) is concentrated upon two comparatively small areas, and in different directions—one at the gingival "f" and the other at the apical area "w"; and consequently with a double opportunity and extent of pericemental movement, and because of the fact also that the force exerted upon the intermediate

cuspid pier thru the medium of the bridge span, "s" Figure 1, and when it reaches the cuspid it is exerted in the form of torsional force upon its attachments to the crown. This is a very different character of applied force from that which moved the molar, and also with very diminished mechanical advantage toward moving the cuspid. At the molar the fulcrum of the hypothetical lever of movement is at the gingival borders of the alveoli ("f" Figure 2) with the point of power distantly located at the occlusal area ("p"). Whereas at the cuspid pier (Figure 4) both the fulcrum and power are located near together within the area of its immediate attachment, "p" and "f", and with a twist movement whose center of circular torsional action (s) is exactly in the center of the attachment, with its area of work ("w") distributed over the entire length of the socket to the very apical end of the root.

area of the socket is gradually reduced toward its center to zero magnitude. (z).

Whereas, with bodily movements (Figure 3) all the force must be exerted in one direction upon the walls of the socket, and distributed over the entire resisting area "h", and consequently with the possibility and extent of pericemental movement of only one thickness of its tissue.

Moreover, the masticating lateral force, or power back of the movement, being applied at the cusps, is exerted at the most mechanically advantageous point.

To practically illustrate this movement, grasp a lower molar between the thumb and finger and see how easily and appreciably you can move it from side to side. But not by any means as easily or to the same extent when you attempt to move it bodily.

Now when this movement of the molar pier occurs, without the same motive force exerted upon the cuspid pier, it must forcibly tend to move the roots of the cuspid in exactly the same directions as the roots of the molar move. Think for a moment what that means on the cuspid attachment. This inclination movement of the molar must communicate the force of its movement to the

As long as the bridge attachments retain their integrity against this powerful torsional strain, the pericemental movement of the cuspid root will partake principally of that of a bodily movement. I do not believe that any one who is not intimately acquainted with the principles of applied mechanics, or who has not had considerable experience in orthopedic movements of teeth, can appreciate the magnitude of force that would be necessary to move the long roots of cuspids, even slightly, in that way. While it is comparatively easy to slightly move the cuspids from side to side in their root sockets by a pull or push force directed upon the crowns, we would find it would take far more force to produce that same character of tipping movement which the molar takes, with torsional force exerted thru the medium of a rigid bar, or the span of a bridge attached to some very limited area upon its crown.

I am pleased to learn from every quarter that a large proportion of those orthodontists who have been futilely trying to accomplish bodily labial movements of the front teeth with some of the marketed force appliances, according to these same torsional principles, are

now adopting the long established true principles of mechanics. It was incontrovertibly shown in an article, which I published in the Items, that the points of power and fulcrum of these torsional force appliances were only distant from each other the width of a narrow ribbon arch bow (.035") located at the center of the incisor crowns, with the very questionable and certainly tedious possibility of moving the distantly located roots and alveolar process bodily forward and sufficiently to correct pronounced retruded facial deformities.

I do not wish to be understood as claiming that the mechanical forces of mastication, producing incoordinate root movements, will immediately break down properly constructed fixed bridge attachments. I have merely attempted to show the principles of mechanical action, and the lever advantages of the forces, which are repeatedly at work toward some form of failure of a large proportion of structures which come within the category of their greatest influences.

In following the description of the mechanics, showing the character of forces and uneven stresses that are exerted upon fixed bridges by normal root movements, we should not lose sight of the fact that these movements are very slight, and while they cannot be wholly stopped without disaster to the work, we do know that there are many fixed bridges from skillful hands which do respond to all the requirements and which are safely worn for many years. On the other hand I am told that the majority of partial fixed bridge dentures, especially those with long spans which depend upon cast-gold filling attachments at one end or both, cemented into cavities of vital teeth, cannot be depended upon to last many years, because of the uneven strains of masticating forces. This is not so surprising when we realize that there are bridges and bridges, likewise dentists and dentists; and too, when we realize that the strains upon the mesial end attachments of a two pier buccal bridge is at times so great that it has been known to split a devitalized cuspid root thru the medium of its post-attachment.

The frequent desirability of bridging between vital teeth, without devitalizing the pulps to obtain the requisite degree

of permanency has led to many ingenious and useful methods for fixed, movable, and removable bridge dentures.

In regard to the most of these, I must say I am not in accord with any method which premises the devitalization of the pulps of perfectly good teeth, nor one which places them in ultimate jeopardy, and which includes extensive mutilations of sound teeth for large gold inlay attachments and boxings for fixed or removable bridge dentures. This particularly applies to the many requirements of one artificial tooth, front or back, between sound or slightly decayed teeth, and especially for young patients.

In my practice, the bodily labial movement of front teeth, upper and lower, to correct malocclusions and deforming facial retrusions, frequently necessitates opening spaces between the back teeth for an artificial retaining bridge tooth upon each side. I usually manage to have these spaces fall between the bicuspid, and when two artificial teeth are required on one side, as occasionally arises, the bridge retainer extends also between the second bicuspid and first molar. Again, the absence of certain teeth thru extinction of the germs is a frequent occurrence in general practice. In all of these cases for the younger class of patients in which the adjoining teeth are perfect, the demand for prosthetic restoration which will fulfill all mechanical and artistic requirements, must at times appeal to those dentists who aim at the highest attainments, as a great problem.

I must say that I have at times been appalled at the methods that have been adopted for these younger class of patients, tho I have no doubt the work was honestly performed, under the belief that it was the only way to obtain sufficient strength and permanency. But any extensive cutting away of good enamel surfaces, especially on the front teeth of young patients, to obtain solidity of pier attachments, for fixed or removable bridge dentures, with probable eventualities, is certainly objectionable, tho perhaps not always avoidable with our present methods. I predict that the day is not far distant when another method will arise which will be constructed with greater ease and less suffering to the patient, and will prove to be far more permanent in these special cases, because in its fixed bridge connections between piers, it will possess sufficient

resiliency to permit masticating root movements without destroying the permanency of attachments.

In conclusion, I have to offer a silent but impressive argument against the universal and indiscriminate use of removable bridge-work. (Figure 5.)

Figure 5.

*Forsoyth Dental Infirmary
for Children
110 The Fenwick Boston*

G. W. Dittmar: We have listened to a masterly paper delivered in a masterly way; both are characteristic of Dr. Goslee. I have not a single objection to offer. I entirely agree with the essayist, I agree so much with the whole tenor of the subject as presented that I do not feel I should take any time in discussing it, because I can not emphasize more than he has emphasized the points, he has made, and yet I suppose it is up to me to say a few words.

It seems to me that one of the most fundamental points that Dr. Goslee made is the importance of observing the law of physics in the building of bridges. The thing that causes the loss of teeth more than anything else, barring bad root-canal work, is undue stress. In the

excellent letter read by Dr. Goslee, from Dr. Case; that was strikingly and convincingly illustrated.

Septic dentistry was another subject that Dr. Goslee spoke of. There are probably four things in bridge-work which produce septic dentistry. The first is the great bugaboo, defective root-canal fillings. That is probably the cause of more sepsis than anything else. Second, faulty fitting of abutments and piers. Third, faulty form of abutments, piers and dummies. See that these are so formed that they will prevent gingival irritation. Then the fourth important thing is undue stress. These four things produce a great deal of septic dentistry. If however a fixed bridge is placed, where it is indicated, and properly constructed, and the patient will take care of the mouth, I think it is one of the best forms of dental restoration that can be placed in the mouth. Personally I would not consider discontinuing the making of fixed bridges. On the other hand, I do not believe that fixed bridge-work is the proper thing in all cases. There are certain decided advantages in removable bridge-work. There are places where removable bridge-work or removable partial dentures need to be placed, especially where long spans are required and there is much loss of tissue. There are some places where fixed bridge-work would not at all be the proper thing. I want to endorse every word that Doctor Goslee uttered regarding the Chayes system of bridge-work. It is not to be unjustly condemned, it has a place in certain selected places, but it should be attempted only by the exceptionally highly skilled dental mechanic. I have little patience with some of the claims made for this so called movable removable type of bridge-work.

Dr. Goslee in the summing up of his discussion mentioned four or five points. He said there is no one line of mechanical ideas that should prevail; no one system; no one method. No one indivi-

dual idea is so broad or comprehensive as to be universally applied. I certainly agree with all that. All the systems have a place for carefully selected cases. The one to use is the one which will be the most efficient for the patient coupled with comfort, durability and the proper esthetic effect.

I did not have time to prepare a discussion. I only had time to glance over the paper this evening. I listened to the paper so attentively that I could not prepare a proper discussion. Nevertheless I appreciate the privilege of saying these few words.

R. L. Stout: I was agreeably surprised today when I read Dr. Goslee's paper to find the stand which he took. I was prepared to battle for the small fixed appliance and against some of the more complicated forms of removable bridge-work. The word 'usefulness' is the big word in the title of this paper, which is "The Comparative Usefulness of 'Fixed' and 'Removable' Bridge-work." If you go to the dictionary, you find that Webster defines usefulness as "having the quality or state of being useful." If we look for useful, we find "serviceable to an end, helpful, beneficial." The question to decide is, "Has a bridge been useful during the time it has been in service?"

Dr. Goslee indicated in his paper that dentistry was not yet a science. I believe that if we will inoculate the knowledge that we have at the present time with a little more common sense, we will approach a little nearer to being a science.

To condemn fixed bridge-work because some operators have disregarded all the laws known to dental science, would be just as sensible as to condemn the internal combustion gas engine because somebody forgot to put oil in the motor and it stopped on a lonely road from lack of lubrication. The enthusiasm of

the patient was given as one of the reasons why fixed bridges fail. Patients, as a rule, have a dislike for anything removable, and it is for us to teach them the advantage of a practical method of restoration which is best suited to their individual cases, and if we allow them to persuade us to place work that will fail, we ourselves must take the blame and not let it fall on the principle of fixed bridge-work.

Dr. Goslee spoke of the "over-enthusiastic followers of focal infection." I would just like to say that I do not believe we have begun to get enthusiastic over focal infection in the jaw. I do not mean by that that we have not yet started to get rid of all the teeth that show infection, but I do mean that when we really get enthusiastic, we will never attempt to remove the pulp of a tooth without first looking at the condition in the jaw and then we will look at it again as we treat it, and then we will look at it again after our treatment is complete. Then if we feel reasonably sure that that operation has been a success, we can go ahead and build any kind of a structure on it. When we begin to do that, fixed bridge-work will not come in for the condemnation it has in the past.

I would just like to say that I think it is about time that somebody in our profession stood up for our rights and demanded that the dentist should be the only court with the right to condemn a tooth to the forceps.

G. H. Henderson: That was a very interesting paper tonight, and I hope some of us will take it to heart, for ever since our good English friend, Dr. Hunter, condemned bridge-work, there has been a change in dentistry. One reason for so much condemnation of bridge-work is because we as dentists have been in the habit of speaking of *dead teeth*. What is a dead tooth? A dead tooth will not remain in the mouth. We should not talk of dead teeth, but

should say pulpless teeth. Neither should we talk about destroying nerves but should say pulps. Let us talk to our patients as tho they had common sense, and if they have none we can put some in them. Our great bugbear is the proper filling of the canals. We know that. A recent number of The Ladies Home Journal had a photo of our lamented friend, Teddy Roosevelt, and two pictures of teeth, supposedly his. The article accompanying them was written by A. M. Jungman. I do not believe he is either a physician or a dentist. He quotes Dr. Henry A. Cotton, Medical Director of the New Jersey State Hospital at Trenton, who says that "Devitalized teeth should not be allowed to remain in the mouth", and a lot more like nonsense. I say that when a man gets to the place where he extracts all pulpless teeth as Dr. Cotton claims they are doing at Trenton, he is in the wrong room in that asylum. I contend that both the articles and the journal ought to be condemned.

I know a dentist in this city who was almost compelled to extract some teeth for a patient because the physician refused to have anything to do with the case until these teeth were removed. On examining these teeth it was found that only one had any reason for its removal.

We have to get down to where we put on bridges in a rational way. It is just as Dr. Goslee says, fixed bridge-work is all right in its place. Some men

can only say or do one thing. I have met men who will only put in fixed bridge-work, others will only put in the removable kind. A man who cannot differentiate between the different remedies that we can use is not fit to practice dentistry. We must get down to where we can do things on a rational basis. I hope some of you will read the April number of The Ladies Home Journal and condemn this article as I have done.

Dr. Goslee (Closing): Mr. President, ladies and gentlemen: I have very little to say in closing excepting that I want to thank those who came tonight. I regard it as a compliment both to the subject and to the essayist. Any one who would come out a night like this certainly wanted to hear the paper. I enjoyed the discussion very much but there has not been enough of it, which is a disappointment to me.

By way of explanation I might say this before I close. I intimated at the beginning that I had intended to write a paper along these lines for a long while and so I have. I had such a desire for only one reason. I thought it was necessary for some one to take the stand that I took tonight. Some operators are running wild in certain parts of the country over a certain class of work. I say wild, but that does not cover it and I think some one ought to take them to task.

I want to thank the President, Secretary and the Program Committee for giving me the opportunity to do so.