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The principles and art of retention

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As the practice of orthodontia has developed in the last decade, it has been increasingly evident that the eventual and practical success of these operations greatly depends upon the success of the retention, and that the retention of the varied malocclusions met with in practice is not by any means as simple as it at first seemed to be.

The forces operating in the retention of teeth are mechanical and functional. By mechanical, we mean various fixtures cemented to the teeth or worn in the mouth to prevent return to their original positions. By functional, we mean those forces having to do with the causes of malocclusion and their restoration to a normal condition. Before we can be assured of successful retention, there must be a restoration to normal in the habits of mastication, in the strength and normal exercise of the muscles of the face and internal structures involved. Faulty habits must be corrected, and the bony and soft tissues must be restored to a normal condition before final retention can be assured. The normal exercise of these functions is a most important factor in final retention.

During the restoration of these various conditions to normal it has always been known that some form of mechanical retention is required. But it must be clearly evident that the length of time necessary for the restoration of these functions is unknown in the various cases and from their nature cannot be accurately estimated. Even the nature and manner of working and pathology involved of many of them is unknown and must vary greatly in different cases, so it is evident that it is impossible to fix even an accurate approximation of the time necessary for mechanical retention. Herein lies the cause for many of the failures in retention. As this truth gradually became apparent, it was natural that good judgment compelled the practice of leaving the mechanical retention fixtures in place considerably longer than the extreme time that was possibly necessary. To this practice there are some very decided objections.

First, as experience has shown that the retention period must be at least twice the period of movement in the average case, and this period of movement averages at least from one to two years, it compels the fixed retention appliance to be worn from two to three years. During this time inspection is less frequent than during treatment, and cemented bands are liable to become loosened and be unobserved either by the patient or operator, and often decay or disintegration of the enamel results.

Second, the wires may be bent by the force of mastication and the banded teeth consequently misplaced.

Third, the brushing and cleaning of the teeth is interfered with, with resulting injury to the enamel and soft tissues.

Fourth, the rigidity of the appliance restricts the individual movement of the teeth and often prevents their settling into perfect interdigitation and locking of the cusps.

Fifth, bands on the teeth are unsightly and the wearing of them for so long a time decreases the desirability and the practicability of the whole operation.

To illustrate these points more clearly, I will show some illustrations of the most approved fixed retaining appliances. (Nineteen slides of the usual types of fixed retaining appliances were here shown and their objectionable features discussed.) As these objectionable features of fixed retention have always been more or less clearly comprehended, certain types of removable fixtures have often been used for retaining the expansion of the arch and other simple movements. Dr Angle has always recommended a removable retaining appliance wherever possible. Ottolengui and Jackson have used them extensively, but so far as I have been able to discover, none of them were used in cases where teeth were rotated, and this fact limited their use to very simple cases.

As mentioned in a former paper on this subject, read before the American Society of Orthodontists at St. Louis in March, 1919, I am indebted to Dr R D McBride of Dresden, Germany, for the vital principle in the removable retainer which I have developed, which obviates most of the objectionable features of fixed retention mentioned above. In 1906, Dr McBride showed me a removable retainer which he was then using, involving to me a new principle in the retention of rotated teeth. The original and important feature of this appliance, which I had seen in no other up to this time, consists in the retaining of rotated teeth by means of an accurately fitting lingual plate with the labial wire, this wire preventing the teeth from lifting away from the plate, which they must do in order to return to their original positions. The fact that this can be done has immeasurably extended the possibilities of a removable retainer. While this new and valuable principle was contained in Dr McBride's original retainer, yet it had some very objectionable features. The flat pieces extending between the first molars and second bicuspids compelled a considerable separation between these teeth, and food often became packed in the spaces. Also, if the retainer was left out for a day, the spaces would often close sufficiently to make its adjustment difficult or impossible. The labial bar also was too heavy and had too long a span without support and did not have an

elastic tension. The side planes for holding the mesio-distal relation were often unsuccessful and interfered very considerably with the stability of the appliance.

The retainer, as I have developed and am now using, consists of a skeleton plate fitting accurately the lingual surfaces of the teeth. Attached to the plate, or if of vulcanite, embedded in it, is a 19 gauge gold wire which passes out to the labial surface through the space at the back of the cuspids. On the labial surface, loops are formed which are joined by a flat wire, .022 by .036 ; attached to the loops and extending distally, are bicuspid clasps (Figs. 1 and 2). The object of the loops is to afford an elastic pressure easily adjustable to any desired degree. The clasps on the bicuspids are a very important feature, the complete success of the appliance depending largely on their efficiency. This clasp has been greatly improved over the one shown in 1919. The lower appliance has also been much improved and made more successful. The clasps have a definite elastic or spring adjustment and can be raised or lowered by bending with pliers just above the attachment to the main wire. It is the efficiency of this clasp that makes it possible to use a skeleton plate which is much more comfortable than a full roof plate.

The lower retainer is similar to the upper, except that it has been found necessary in many cases to make it more stable by the use of bands on the canines or first bicuspids. Unless the lower first bicuspids are fully erupted, which they seldom are up to the age of 13 or 14, the clasps are not efficient alone and the plate will be pushed out of place with the tongue. It must snap into place accurately and stay securely. This result I have secured as stated before, and shown in the following slides (Figs. 3, 4 and 5). In the form shown in Figure 3, the bands may be removed at a future time, when the bicuspids are fully erupted, and the retention may be continued without them. As they are only .003 in thickness, it may not even require the making of a new retainer, except in the cases where the canines are banded, when the addition of the bicuspid clasps is necessary.

I rather prefer the two forms where the canines are banded for the reason that it is possible to fit a band securely and accurately to this tooth and it is very seldom that

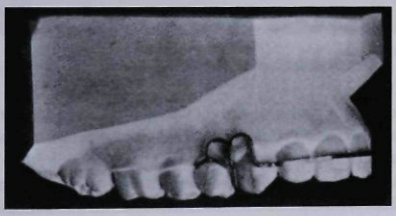

Figure 1

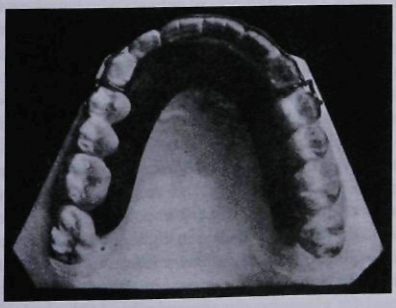

Figure 2

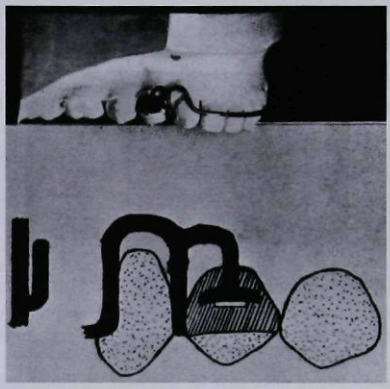

Figure 3

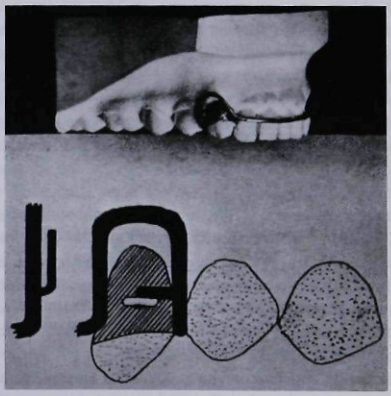

Figure 4

they become loosened or cause injury to the enamel or soft tissues. Also, it affords a secure means of retaining the canines, which is often difficult if they have been considerably rotated.

Since adopting this procedure, I have had practically no failures with the lower teeth. It is advisable to place a wire spur on the lower plate opposite the first molars, which bends over into the groove between the lingual cusps and prevents the plate being forced downward by the stress of mastication (Fig. 6).

As examples of the efficiency of this appliance, I will show four cases involving rotated teeth which have had no other form of retention (Figs. 7, 8 and 9 show the upper only. Figs. 10, 11 and 12 show the upper and lower of same case, the corrected lower with the retainer in place).

In using this method of retention it is preferable, though not always necessary or possible, to let the teeth rest in a stable position, after movement, for three or four weeks before applying the retainer; or in some cases, to retain with a fixed retainer for a few months or a year.

The method of procedure in applying the retainer has been described in my former paper, but I think it will be well to refer to it briefly here. When the case is considered ready for retention, the appliances are all removed, the teeth cleansed and an impression taken with D.M.C. white composition. I do not use plaster for impression. A model is made of hard plaster. I use Kerr's snow white plaster, though white artificial stone is excellent but takes more time. The wires are bent with hand pliers on this model, removed, and then the model is covered with No. 60 tinfoil by the usual method, the wires placed on it again and the case waxed, vulcanised and finished (Fig. 13).

I allow two or three days for this work. In fitting into the mouth, the clasps are first fitted to the proper place just above the gum line over the convex surface of the tooth, and given the proper spring tension to hold them securely in place. This adjustment must be made carefully, as too much pressure will extrude the tooth. Then the labial loops are closed until the wire has a slight tension against each tooth at the point where the tooth must lift away to rotate. This adjustment is finally tested by passing a piece of floss silk along between the flat bar and the teeth. It is then removed and replaced several times to make sure that the adjustment is correct. The patient is usually then dismissed with instructions to wear it all the time for a couple of days before returning. Upon their return they are shown how to remove, cleanse and return it to place, and instructed to wear it all the time, except to remove it at meals, then to cleanse the teeth and return it. It is worn in this way for from two to six months, when, if the teeth are found to be settled into close occlusion, it need only be worn at night.

During this period it can be removed for a couple of hours in the evening occasionally, if desired for some special occasion. Young ladies especially appreciate this privilege.

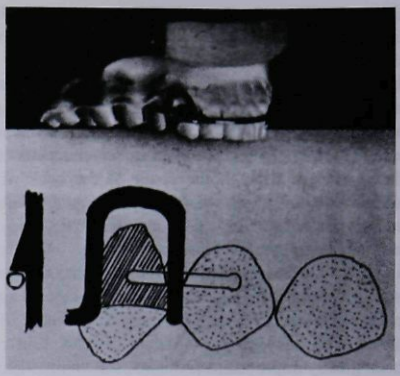

Figure 5

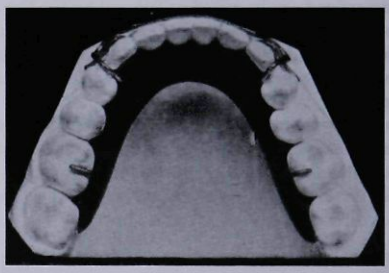

Figure 6

After about a year of the night wearing it can be left out for several days or a week with the special caution that whenever the appliance binds or seems to go into place with any difficulty it is a sign that the teeth are moving and the more constant wearing must be resumed. The retainers should be examined occasionally and the clasps and front bar adjusted where they have lost any tension from removal and replacement. I have numbers of patients who have kept their retainers for four and five years and more, occasionally during the later period putting them in as a check against retrogressive movement.

As an example of the possibilities of the method of retention, under special condition, I will mention two cases. The first, was that of a young lady, 27 years of age. The slides show the case at the beginning and after a year of retention. This, young lady was engaged in public work where her appearance was very important. The movement of the teeth was accomplished in eight months. The retainer was applied about a week after the movement was finished. It was worn constantly day and night except, of course, the removal for cleansing, for three weeks. At the end of this time it was removed from 9 in the morning until 12, then

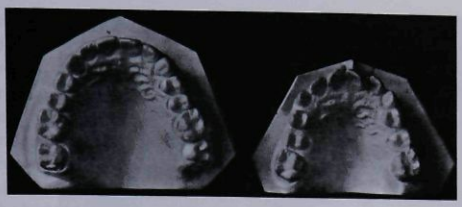

Figure 7

Figure 8

Figure 9

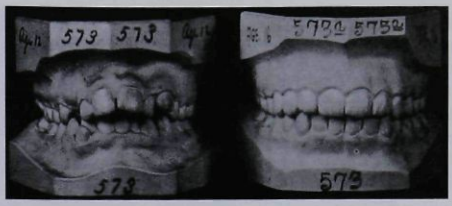

Figure 10

Figure 11

Figure 12

replaced for an hour, then removed again from about 1 o'clock to 5 in the afternoon. It was worn during the evening and night. After two months it was removed from 9 until 5. During all this time it was removed occasionally in the evening for a couple of hours where public appearance made it very desirable. With this amount of wearing the teeth have remained as you see them (Figs. 14 and 15).

The second case, a young lady, twenty-one years of age, was also engaged in an occupation where her appearance was important. In this case the matter was complicated by the loss of the two upper first bicuspids. The movement was completed in 10 months. A retainer was applied with two teeth attached to fill the space made by the missing bicuspids and it was worn in the regular way for about three months. Then a small gold plate was made with teeth attached and worn during the day, thus doing away with the labial wire; at night this was removed and the regular retainer substituted. At the end of 18 months the teeth have remained as you see them (Figs. 16 and 17). Figure 18 shows the gold plate worn during the day.

I have already pointed out the advantages of this method of retention from the standpoint of cleanliness and safety of the teeth from decay. As time has gone on during the years I have used it, and have observed its action under various conditions, I am more and more impressed with the advantages of this method of retention in furnishing just the amount of mechanical restriction necessary, and allowing the greatest freedom for the play and adjustment of those natural forces upon which we must rely for final permanence of our work. Among the minor points to be mentioned are the correction of small rotations after the retainer is adjusted. If there has been an open bite the labial wire must be placed as high as possible and above the convex of the labial surface of the teeth and, conversely, if the teeth have been intruded it must be placed low. If the wires break, they can be repaired by first wrapping the vulcanite part with a thin layer of wet asbestos wool and then soldering free hand in the open blowpipe flame. Bite planes (Fig. 19) may be used where indicated, either for correcting the overbite or for assistance in holding the mesiodistal relation. They may be made wide at first and gradually cut down to a narrow ledge as the progress of the case may indicate.

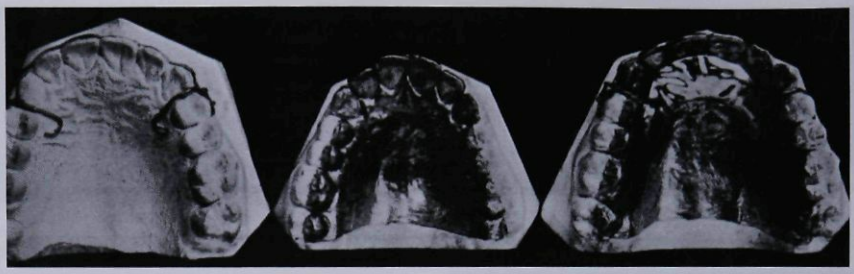

Figure 13

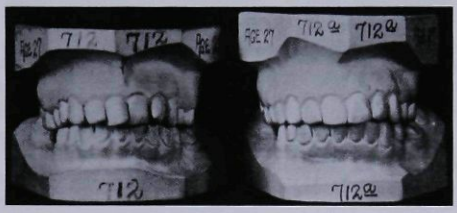

Figure 14

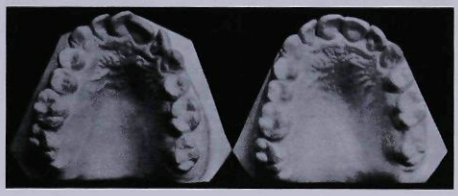

Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

Discussion

The President said that when he heard that Dr Hawley was to read a paper to the Society he felt sure the members would hear something worth listening to. Certainly the subject was one of the most practical that orthodontists had to consider.

Dr J T Quintero said he should like to show some slides on the subject. He had been very pleased to hear what Dr Hawley had said about his retainer, because he had been trying to use it from the descriptions Dr Hawley published

two or three years ago in the Cosmos and in the International Journal. He had found that that retainer gave him the best results when he had had considerable expansion and little rotation. He supposed he did not manipulate his labial wires correctly, but personally he had found it difficult to retain rotations in the anterior teeth with that appliance. He noticed, however, that the labial wires Dr Hawley now used were different from those which he himself had used. The slides he had to show illustrated the advantage of the appliances.

The case was one which he had treated, a Class II division 1, according to Angle's classification. The slides showed that he had not obtained perfect interdigitation at the time he put in the retainer. After the retainer had been worn for a year, there was perfect interdigitation and the teeth were in perfect occlusion all round. He did not think such results could be obtained with a fixed retainer, and that was the reason why he was so pleased with the retainer shown. He did not use it in every case, but so far he had used it only where there had been a small amount of rotation and large expansion. He had found it retained expansion better than the fixed appliances.

Dr F L Stanton said the appliance was very generally used in the United States, and he did not think he could add anything to what Dr Hawley had said on the subject.

The President said the subject was one of very great importance, being a question of removable versus fixed retaining appliances.

Dr W S Davenport said he was old enough to know something of the history of orthodontia, having been practising it for the last 24 years. What gave him the greatest possible pleasure was the practical form of the old fundamental ideas on which progress was based. It was always necessary to have fundamental principles to begin with. Dr Hawley had shown how a very simple appliance could bring about a very great result. Any retaining appliance that locked the teeth together and prevented the normal action of the teeth was fundamentally wrong. The appliance shown had very many ingenious improvements. Kingsley's jump bite plane, with very ingenious little bands round the front of the teeth, had been used by a good many, but to his knowledge the ingenuity which was so essential in keeping the appliance in perfect position whereby it only permitted of the natural shaping of the teeth into proper positions and prevented their returning had not been very much used. The fault of the old Kingsley appliance was the tendency, even with the bite guide, for all the teeth to return. He had many failures when using the Kingsley appliance with the bands as used by Dr McBride, but as it had been worked out now it seemed to establish a fundamental principle, keeping the teeth in such position as to prevent a return to a wrong position which, of course, meant more success with the case. It only showed how a little thing, if applied logically, could be made a success.

Dr E D Barrows asked what disadvantage there was in using the inner arch and the removable outer arch on the uppers. He had used the plates for many years and he was using a few of the inner arches now, and he should like to know what the decision was in America as to which was the better appliance.

Dr A L Hipwell thanked Dr Hawley for his paper and said it was encouraging to those who were practising in Europe to have a man like Dr Hawley coming over and giving his scientific views on retention. It seemed to him that orthodontists were aiming at obtaining preventative dentistry and preventative orthodontia, and he was wondering whether preventative retention could be also obtained. Until the child or the patient was instructed in breathing after the operation had finished, and in ceasing the diabolical habit of lip-biting, there could be no very good result. If those habits could be overcome, the child would feel very much better, and the natural retention would be helped. He had been told that if the child could be taught normal habits and kept perfectly well, that alone was going to be better than any mechanical appliance.

Dr Secker (Copenhagen) said he preferred the natural articulation as much as possible. Where it was necessary to use a retention plate he wanted to have it so arranged that the patient could learn to take it out and keep it clean, and clean the teeth in order that no decay might occur.

Dr Hawley, in reply, said he had shown two cases where there was extensive rotation, particularly in the cleft palate case, to illustrate how it was possible to retain rotated teeth. It was possible to retain expansion of the arch with removable appliances, but the question was whether rotated teeth could be retained. He was pleased with what Dr Davenport had said. He had mentioned in the paper, and many times before, the sort of amusement he had in thinking there was no new thing about the retainer he had shown. He had thought he had something new in the bicuspid clasp, but he found that somebody had been using that clasp before. The only credit he could take with regard to the new thing he had shown was the development and the combination of all the things that had gone before. There was a tendency sometimes to look with a little amusement at old things, but those old things had some merit or they would not have been used. Many times they were combined with objectionable features. We travelled in circles very often; it was very much like going up a spiral hill, coming round to the same place time after time, but just a little higher up. With regard to Dr Kingsley's appliance, it had some bad features, but the principle was there, and combined with the plate that was clasped in place it was of considerable use. Dr Hipwell had mentioned the fact that natural forces should be relied upon. That was very true, but one should not get any such chimerical idea in one's head as that natural forces would retain teeth at first. They helped a good deal. Most of the causes of mouth-breathing and bad habits were unknown, and until they were known it was necessary to have some mechanical restriction. Until that time came he felt he had the most practical retention, which did not interfere in the

least with the natural forces becoming established. The retention was safe, and there was no injury to the teeth from unobserved decay about the bands. The patient was freed as much as possible from the disagreeable appearance of retention. The whole operation was very practical, and that meant a good deal. The wearing of a band could be made so unpleasant that the operation would not be undertaken. The appliance he had shown added a great deal to the comfort and pleasant features of the whole operation, and he could hardly express the relief it had been to him in his own practice. It had really lifted from his shoulders fully 50 per cent of the disagreeable features.