PREVENTIVE AND INTERCEPTIVE ORTHODONTICS IN THE MIXED DENTITION WITH THE OCCLUS-O-GUIDE APPLIANCE: CORRECTION OF OVERBITE AND OVERJET

Preventive and/or interceptive orthodontics in the mixed dentition implies several different possibilities, namely, (a) the guiding of erupting permanent teeth into an ideal position; (b) using simplified procedures that produce a savings of time and effort; (c) obtaining a more stable early result with less retention problems; (d) avoidance of extraction of permanent teeth by utilizing the additional deciduous posterior tooth mass, distalization and/or expansion of posterior segments. These are compelling reasons for early treatment and historically there has been great interest in early interventive orthodontics beginning over 70 years ago[1] and becoming quite popular from 1950 to 1975[2-11], while others[12-14] warned of the difficulties of predicting arch form, the need for extractions, anchorage control difficulties, proper control of Class II Division 1 cases and neuromuscular problems. Most orthodontists gradually became disenchanted with early treatment due to the inability to properly correct overbite and overjet with fixed appliances at this age because of lack of erupted posterior permanent teeth which are necessary for anchorage. A second phase of full treatment usually followed and this extended the time in appliances for the "worn-out" patient. Two studies from the Burlington Growth Center[15] of 1,258 patients and the University of Pennsylvania[16] of 4,200 patients indicated the need was high (80% and 95.4% in the young patient) but those who actually could be treated with the available appliances at that age was disappointingly low (21.7% and 14.3%). In the Burlington group, 78.8% of the early treatment cases consisted of two or more separate orthodontic procedures while 89.5% of the cases were Class I malocclusions. Ackerman and Proffit[17] summed up the problem by stating that there is a large need for early treatment, while only 15 to 20 per cent of the cases can be successfully managed.

The introduction of the Frankel[18] appliance by McNamara[19] and the Bionator[20] by Witzig[21] in the United States re-awakened interest in mixed dentition treatment since early arch expansion and the correction of overjet and overbite could be essentially handled by a single appliance. Several problems, however, remain for preventive and interceptive (P and I) orthodontics in the mixed dentition, namely that there is a need for more to be done by a single appliance since a relatively high percentage (about 80%) of patients using current removables require further fixed appliance treatment, the stability of early arch expansion, the predictability of potential problems that will persist or those that will self-correct without therapy, whether early correction of problems such as rotation will have long-term stability and what the effects of growth might have on early treatment. Indications as to early arch expansion stability are encouraging, particularly distal to the first deciduous molars[22,23]. This is in contrast to the vast evidence as to the instability of expansion at a later stage in the permanent dentition[24-28]. Overbite and overjet are predictable since there are significant correlations and insignificant differences from the mixed dentition to

the permanent dentition[29-35], and arch form and crowding are also easily estimated[32,36-40]. As to whether rotations and corrected crowding are more permanently corrected prior to collagenous fiber formation, strong evidence points in this direction[41-43], however, more research is needed. Growth research also points to earlier treatment in order to be assured of obtaining enough growth for stable corrections in overbite and overjet[44-48]. The prediction of at least the pubertal growth spurt is easily accomplished with the use of skeletal age determinants[49].

The most compelling reasons for a serious reconsideration of early P and I orthodontics in the mixed dentition are fourfold. First, that treatment is *begun prior to complete collagenous fiber bundle formation* on as many teeth as possible so that when they erupt into the proper position horizontally and vertically, future relapse tendencies are lessened. Most relapse, certainly of rotations and possibly of vertical and horizontal drift as well may at least be partially due to treatment procedures done after complete formation of the supra-alveolar collagenous fibers. These fibers increase in thickness in response to functional and stretching[42] both of which are present during standard fixed appliance therapy. If treatment is begun before the teeth are fully erupted, they can be gently guided into position and completely straightened prior to their fiber formation, thereby theoretically eliminating part of this relapse tendency.

Second, that treatment is begun early enough in a child's life that *adequate facial growth* in the horizontal and/or vertical direction to fully compensate for the correction of overjet and overbite is present. This is particularly critical in moderate to severe discrepancies (over 6 mm.) in both sexes but particularly in the female. If inadequate growth is present, greater relapse can be expected[45]. Functional appliances deal orthopedically with growth, particularly evident in the suppression of forward maxillary growth[50-52], as well as a possible influence on the appositional restructuring of the glenoid fossa[53] and growth of the mandible[54]. From the author's clinical experience, when an orthopedic correction of a horizontal or vertical skeletal or dental discrepancy represented as bone growth correction consists of 70% or more of the total correction, and when the dental correction is 30% or less, the result is extremely stable with little or no relapse. When the dental correction exceeds 30%, relapse of varying degrees occurs. Whenever treatment is attempted on a fully grown patient, the dental correction is close to 100% and adverse tooth tipping can occur[47] which is frequently harmful to the integrity of the supporting tissues of the lower incisors[55] and results also in greater relapse[45].

The *third* reason for P and I orthodontics is that more can be done with the arches and teeth in the mixed dentition through *successful expansion* and utilizing the extra space allowed by the *greater tooth mass of the deciduous posterior teeth*. Up to about 7 mm. of anterior incisal crowding can be compensated thereby eliminating the need for extraction of bicuspids in about 50% of typical orthodontic extraction cases.

The *fourth* reason us that if a *single appliance can correct several varying problems* at the same time in order to eliminate fixed appliance orthodontics in most cases when all permanent teeth erupt, the early treatment suddenly becomes worthwhile. Most of the problems that exist in the mixed dentition can

be corrected all at the same time with the Eruption Guidance Appliance[56,57], (Occlus-o-Guide®)*. These problems are overbite, overjet, crowding up to 4 mm., spacing up to 3 mm., rotations, individual tooth cross-bites, cross-bites of entire quadrants of teeth, constriction of entire arches, posterior mandibular displacements, open bites, improper molar relations (e.g. Class II), dental midline discrepancies and TMJ problems. Ideally, they are most easily corrected prior to
the eruption of the permanent canines, bicuspids and second molars. Problems such as
*Ortho-Tain, Inc.
Class III, maxillary retrusion, mandibular prognathism and of severe crowding, such as those individuals with predicted crowding of the permanent dentition that exceeds the width of one bicuspid (e.g. 8 mm. to 15 mm.) are not amenable to treatment with the Occlus-o-Guide® appliance unless treated by serial extraction, but will not be discussed in this paper.

The Eruption Guidance Appliance alone and in combination with other appliances for early mixed-dentition treatment provides a time-saving and shorted treatment time method that can be used before, during or after permanent teeth erupt with little or no knowledge of fixed appliance therapy. Diagnostic ability in recognizing and predicting the outcome of problems and timing of appliance use is of utmost importance in the proper use of the Myofunctional Eruption Guidance Appliance, or Occlus-o-Guide®. An analysis of each correctable factor and its early preventive treatment will be discussed.

Material

The growth data used for standards in this study were obtained from longitudinal records of The Denver Growth Study of the University of Colorado Medical School[58,59]. The lateral cephalometric records were corrected for radiographic enlargement[60] and consisted of twenty-five females and twenty-five males with yearly cephalometric radiographs from four years to full maturity (mean adult age of twenty years). The clinical records of cases treated with the Occlus-o-Guide® appliance were drawn from the author's private orthodontic practice and were all charged for services rendered on the same basis as all other cases accepted for similar treatment.

Technique of Measuring and Fitting the Appliance

The appliance[56,57] is premade in various sizes from #1G through #7G with half-sizes for a total of 13 for the mixed dentition and 13 N sizes for the permanent dentition. The appliance is also available in 11 sizes for serial extraction cases involving the extraction of four bicuspids (1X through 6X) and in 9 sizes for the extraction of two upper bicuspids (2U through 6U). There is also a series for the final correction of a resistant overjet where maybe a 2 to 3 mm. correction is difficult to finalize. These come also in 11 sizes from 1H through 7H. All full sizes vary by 3 mm. from distal of canine to distal of canine. Half-sizes vary in the same way by 1½ mm.. Figure 1 shows the measurement from the distal surface of the maxillary lateral incisor along the incisal edges to the distal of the opposite lateral incisor. A close fit is obtained to fit within one-half millimeter from side to side. The lower jaw is closed into the appliance and the margins

are looked at to be sure that the appliance does not dig into tissue. If it does, the offending plastic area is trimmed with an acrylic flame-shaped bur or on a green stone on the lathe. The lower teeth should fit into the appliance almost exactly also. Then the posterior teeth are checked to be sure they all go into their sockets fairly well.

If there is spacing, a smaller size has to be placed. If there is a 1 mm. space, the same size is used. If there is a 1½ mm. space, the next smaller half size is used (e.g. instead of a 4G use a 3½G). If there is a 2 mm. space, still only go down a half size. Only with a space of 3 mm. would the next full size be used. In spaced cases, always fit the appliance slightly small, otherwise the spaces will never completely close. In crowding, it is the opposite. A larger size is used and always err on the larger size. For example, if the case has 1 mm. of crowding, go up a half size. If there is 2 mm. of crowding, use a full size larger..

The patient is told to wear the appliance 2 to 4 hours per day with exercise (heavy clenching for 1 minute or more, then relax for one-half minute). These exercises should last at least for 20 minutes at a time and should add up to 2 to 4 hours per day and also passively at night.

Overbite

Anterior overbite in the permanent dentition is predictable from eight years onward[34]. For example, a child at 8 years of age with an overbite that exceeds 3 mm. will have an overbite that exceeds 3 mm. by 18 years of age 79% of the time. The Occlus-o-Guide® appliance can correct this overbite in the mixed dentition at 4.4 times the rate of speed that fixed appliances correct it[56] during the permanent dentition in 10% of the chairtime. Ideally, it should be corrected as the permanent canines and bicuspids erupt into the mouth. The more of these opposing teeth erupt during the use of the Occlus-o-Guide®, the less the corrected dentition usually has to be retained following the correction. It therefore seems advantageous to correct overbite in the mixed dentition. Stability of the overbite appears to be dependent on the *number of opposing teeth that were in the process of active eruption* at the time of Occlus-o-Guide® use. Figure 2 illustrates the stability obtained in such a case.

Vertical growth is also a factor, and is particularly meaningful in females due to their smaller intensity of growth and accelerated timing over males. The amount of growth present during orthodontic treatment appears to be significantly related to the ultimate success following the retention period[45]. For example, a 4 mm. overbite correction, if dependent on 4 mm. of vertical facial growth (ANS-Me) would have to have treatment started by 14 years 3 months in the male and 11 years 4 months in the female[45]. An overbite of 7 mm. similarly would have to be started by 11 years 11 months in the male and 7 years 4 months in the female. It becomes obvious that to correct overbite and have it be stable after retention, provided it is dependent on vertical facial growth, early treatment is essential. It seems that ideal timing and favorable retention, however, is more dependent on tooth eruption than growth, from the author's clinical experience. Overbite treatment probably should start immediately as the mandibular deciduous canines are lost and just prior to the beginning eruption of the permanent canines and bicuspids. By the time these teeth are completely erupted, the overbite is usually fully corrected. Following their full

eruption, the collagenous fibers probably form and aid greatly in the retention of the overbite correction. Figure 3 shows such a case where the appliance was worn 2 to 4 hours per day to correct the overbite as these posterior permanent teeth erupted. Once the overbite was corrected to within one-half mm. of perfection (total overbite of 1½ mm.) in the female and to within 1 mm. of perfection (total overbite of 2 mm.) in the male (provided they have not entered their pubertal growth spurt), active treatment of 2 to 4 hours per day of exercise was stopped. The child is then asked to wear the appliance one hour per day and at night for about 6 months to one year, after which the appliance is worn only at night until the second permanent bicuspids and molars erupt or until enough vertical facial growth h as occurred to equal the amount of overbite corrected. This amount of passive wear is enough to guide the erupting teeth into their correct intercuspation. The most advantageous way to test this growth is simply to have the patient wear the Occlus-o-Guide® as little as possible without any observable relapse. If no relapse occurs with one hour each day and every night, then proceed to one hour every other day and every other night, and then to every third day and every third night, etc.. If the patient doesn't relapse in 3 months with wearing the appliance one hour per day every third day (and every third night), then proceed to one h our per week (and one night per week) and if that succeeds just wear it one night per week and so on. If at any time you observe a relapse in the overbite, an increase in the daytime exercise is necessary. Those individuals with a tendency toward longer faces seem to have a greater amount of vertical alveolar growth over a 3 year period (r = .42*) and will therefore require less retention than those children with shorter face heights. A statistical comparison of N-Me at 9 years of age to the amount of growth of ANS-Me from 8 to 11 years of age was statistically significant at the 5% level of confidence (r = .42*). The greatest amount of vertical alveolar growth (ANS-Me) during the 8 - 11 year period was 6.85 mm. and the least was 1.75 mm., so there obviously might be considerable variation in the success of retention for different children.

The treatment of the overbite can be accelerated by adding 3 to 5 mm. of acrylic in the incisor sockets of the appliance partially through treatment to open the material vertically between the arches in the anterior area. Other ways to speed the treatment is to prolong the use of the G series appliance during the eruption of the second molars and trim the first molar sockets from the posterior portion of the appliance so that the first molars tend to overerupt from the eruptive force of the second-molars. A bite-plate in acrylic can also be made to keep the corrected overbite from slipping in the anterior area during daytime wear when the Occlus-o-Guide® is not being worn. It is important that the posterior teeth are free to erupt, however, when this acrylic anterior bite-plate is worn.

Retention of overbite correction during early preventive orthodontic treatment is minimal when the treatment with the Occlus-o-Guide® is properly timed to coincide with permanent canine and bicuspid tooth eruption. The more of these permanent teeth that are erupting during the Occlus-o-Guide® is properly timed to coincide with permanent canine and bicuspid tooth eruption. The more of these permanent teeth that are erupting during the Occlus-o-Guide® treatment, the less the case usually has to be retained. If only two teeth on each side are mutually supporting the vertical dimension of the occlusion and were in their eruptive stage during treatment, the retention has to be carefully monitored and the case

should probably be in retention 1 to 2 years. If several teeth on each side were erupting at the time of treatment and are mutually supportive vertically (e.g. 6 to 8 teeth per side), retention is quite easy and the overbite usually holds well with only 6 months of retention. *Timing is therefore very important for* successful early preventive treatment and seems to be more critical in overbite than overjet corrections.

Proper retention of early preventive overbite corrections, as previously mentioned, seems to be dependent on two rather disassociated factors, namely, collagenous fiber formation (particularly interseptal) and alveolar and vertical jaw growth. Correct timing for proper fiber formation occurs when treatment is initiated either prior or during active tooth eruption, before any occlusal contact of opposing teeth occurs. Alveolar and vertical jaw growth is due to early timing which makes use of active growth periods. Which is more important: Overbite correction is faster and seems to retain better if eruption timing is favored over growth timing. When the two (eruption and an active spurt) happen to coincide, unbelievable rapid treatment and successful retention is the result. Unfortunately, this usually does not occur, since the major eruption of the posterior teeth occurs during a major lull in growth and after a major pre-pubertal spurt has already ended, which is usually one to one and one-half years prior to the pubertal spurt[35].

The *manner in which the overbite is corrected* is simply that the forces induced into the appliance are orthopedic in amount since the biting forces generate 150 to 600 pounds per square inch in the upper jaw. This usually almost stops vertical (and horizontal) growth of the maxilla while allowing the posterior teeth to erupt to a new occlusal (more erupted) position, while preventing the anterior teeth from erupting at all. Usually the vertical opening of the jaw is increased (seen as an increase in the mandibular plane). This increase is usually 1 degree for every 2.5 mm. of overbite correction. It is not a permanent change if adequate mandibular growth remains and the anterior face height is normal or less than normal. When the face height is excessive initially, facial growth is not of the strong counter-clockwise rotational type and there is no compensation of the mandibular plane (where more growth is present posteriorly which lowers the posterior portion of the lower border of the mandible) which would bring the mandibular plane back to the normal position by closing the mandibular plane angle. Therefore, excessive face heights (particularly lower ANS-Me) should be avoided in this type of Occlus-o-Guide® treatment. Table I shows the upper limits of the ANS-Me dimension above which treatment with the Occlus-o-Guide® is contraindicated. The greater the overbite and the closer the child is to full maturity, the more carefully these contraindications must be followed, particularly in females.

Overjet

Overjet is more easily corrected than overbite since a higher percentage is corrected with the Occlus-o-Guide® appliance and the rate of correction in the less severe cases is greater for overjet than with overbite and will be corrected with less daytime wear than it takes for overbite. The relapse tendencies for fixed appliance treatment is less (10.7°) than with overbite (35°) as well. Overjet is, however, very important to be corrected in order for overbite to be retained. The two dimensions are

usually corrected with the Occlus-o-Guide® simultaneously when both are present, provided the appliance is worn with daytime exercise. If the Occlus-o-Guide® appliance is worn only at night or minimally during the day, a disproportionate amount of overjet will be corrected as long as there is no incisal contact due to an overbite.

It is important to have the overjet corrected as the permanent canines and bicuspids erupt into position so that they can be guided to their correct positions relative to a Class I occlusion. The overjet is corrected with the Occlus-o-Guide® appliance, when worn 2 to 4 hours actively during the day (with or without night-time wear), by stopping or slowing the anterior directed growth of the maxilla while allowing the mandible to grow at least at its normal rate. It is observed that the mandible proceeds in a forward direction (ART-Gn) usually from 1.5 to 3 times its normal rate, however. The anterior displacement usually is about 1 mm. while the remaining amount is observed as a possible increase in the length of the mandible (ART-Gn), or apposition of the glenoid fossa. Growth spurts (ART-Gn) in the male during the five to seven year period can obtain as much as 5.7 mm. in one year while the average is 3.3 mm. The spurt seen between 9 to 10½ can obtain as much as 3.5 mm. in one year while the average is 2.3 mm. per year. In the female, similar spurts are seen at about 4 to 6 years with the maximum being 5.3 mm. while the average is 2.9 mm. per year[35].

Other studies have shown that corrections of overjet with functional appliances are more efficient when taking place during periods of accelerated facial growth[46-48], and potential growth of the condyle and fossa might be more efficient at earlier ages. Therefore, severe overjets (over 10 mm.) are best treated early so that adequate compensatory facial growth is present. Treatment is ideally started prior to 7 years of age in the male and 6 years of age in the female in order to make use of the spurt seen at this time. If it is inconvenient or impossible to start at this time. the next most advantageous time would be between 9 ands 10½ years in the male and about one year earlier in the female. Since it is impractical to have a child in active treatment longer than one year with the Occlus-o-Guide® appliance, maximum growth utilization (restricted maxillary with normal mandibular growth with 2 to 4 hours per day exercise) giving a total of maxillary plus mandibular growth (ART-ANS + ART-Gn increase) can be expected for only one year, while passive utilization (normal mandibular growth exceeding normal maxillary growth [ART-Gn minus ART-ANS] increase) can be expected for a long as the Occlus-o-Guide® is worn as a retaining positioner. Figuring growth utilization on this basis it is essential that an 8 mm. overjet be started in a male by 11 years 7 months of age and in a female by 9 years 9 months. An overjet of 5 mm., on the other hand, should be started by 15 years 3 months in the male and 12 years 3 months in the female to have sufficient usuable jaw growth for successful retention[35].

Once a deep overbite accompanied by an overjet has been eliminated, there is a tendency for the mandible to grow unrestricted towards a Class III tendency in about 10% of cases (if the treatment is finished prior to the start of the pubertal spurt) as seen in Figure 4. Since this tendency is so irreversible, it is important to prevent it in the beginning. For that reason, it is important to finish overjet and overbite short of perfection when treating early and finishing with treatment before the pubertal spurt, especially in

males since their mandibular growth at this stage is so much more intense than in the female. Therefore, it is recommended that in the male the overbite and overjet is finished
1 mm. short of perfection or to a 2 mm. dimension. In the female, the case can be finished
½ mm. short of perfection or with a 1½ mm. overbite and overjet when finishing prior to the start of the pubertal spurt. If the case does not continue to grow into a full Class I ideal overbite and overjet, the Occlus-o-Guide® appliance can be worn actively (2 to 4 hours daytime exercise) for 1 or 2 months until the case has a perfect relation. This wear can begin half-way through the pubertal spurt so the correction will retain well due to remaining compensatory jaw growth.

Overjet correction is not dependent on tooth eruption as is overbite correction. It is important, however, that moderately severe (6 mm. or more) or severe (10 mm. or more) overjets are *not* corrected when upper permanent canines or other upper permanent teeth are not yet erupted while their corresponding deciduous teeth have already exfoliated and there is minimal room for their successful eruption. There is considerable distalizing force against the anterior segment of the maxilla and can impact the permanent teeth if the spaces are not properly maintained. Figure 5 shows bucco-lingual inserted wires to adequately retain this space while the overjet is being corrected. A cervical head-gear against the upper molars will also protect against this impaction (Fig. 6) as will also waiting to correct the overjet until there are full contacts between all upper teeth (deciduous or permanent). If there are excessive interproximal spaces, there is no worry about impactions until the excess spaces are closed by this same distalizing force and there are unerupted teeth which will become impacted if further distalizing and closure takes place.

Overjet correction with the Occlus-o-Guide® appliance simply takes place by advancement of the mandible with retraction or a distalizing force against the maxilla. This same treatment principle takes place regardless of the severity of the initial overjet. In a minor case, (Fig. 7), it can be seen that the maxilla has been restricted in its forward development in the same way that a severe case would have been restricted. The mandible was advanced also in the same way. Regardless of the severity, there is very little tooth movement as long as there is jaw growth present. The more severe the overjet, the more growth is required to gain a successful correction without tooth movement. The *object of successful Occlus-o-Guide® treatment* is to correct the antero-posterior problem with as much orthopedic bone change (actual growth restriction of the maxilla and "growth acceleration" of the mandible) and as little tooth movement (tooth tipping consisting of lingual incisal crown inclination increase in the maxilla and labial incisal crown inclination increase in the mandible) as possible. The sockets have been purposely designed in the Occlus-o-Guide® to be quite upright in order to create forces along the long axis of the crowns of the upper and especially the lower incisors in order to prevent adverse tipping when occlusal forces are applied to the appliance.

There is little labial tipping of the lower incisors as long as jaw growth remains. It does not appear to be related to the amount of overjet being corrected as long as sufficient mandibular growth is present (Fig. 8). Figure 9 shows a severe adult overjet where little facial growth remains. The correction of overjet occurs at the same rate as a growing patient but it is seen that a severe increase in the lower

incisal crown inclination in a labial direction is the result of "forcing" the correction when no growth remains. This points up to the importance of correcting moderate (6 mm. to 9 mm.) and severe (10 mm. or more) ovejets when sufficient jaw growth is present so that at least 70% of the correction will be the result of a bone (orthopedic) change and less than 30% in tooth change. Minor overjets (5 mm. and less) can be corrected at any age since there will be minimal stress on the inclinations of teeth. There will also be an anterior repositioning of the mandible of about 1 mm. which leaves only 3 mm. for tooth inclination changes and if there are any maxillary anterior spaces present, relatively little change will be seen in the lower incisor inclinations. The "forcing" of even minor adult overjet corrections where gingival recession is already evident on the lower incisors (especially in cases with a thin labio-lingual mandibular body in long faces[55] and also with no maxillary anterior spaces) should be avoided, since any labial movement of the lower incisors might increase the already evident lower gingival recession.

Severe overjets with upright maxillary incisors (especially with interproximal spaces present), regardless of the amount of growth present, will have some lingual inclination of the upper incisors during the Occlus-o-Guide® treatment. It is more prevalent when little or no mandibular growth is present during treatment. With labially inclined maxillary incisors, regardless of the severity of the initial overjet, a favorable final inclination usually results as long as growth is present (Fig. 10).

The use of a cervical head-gear or maxillary bumper inserted into maxillary molar bands in conjunction with the Occlus-o-Guide® appliance to correct an overjet should be reserved for cases with a severely protrusive maxilla (Fig. 11) or in cases that have more than 3 mm. of upper crowding (Fig. 12). If there is no more than 2 mm. of upper crowding in the permanent dentition or 4 mm. in the mixed dentition and there is a normal or only slightly protrusive maxilla, the head-gear is contraindicated. It also applies that if there is an overjet with a retrusive maxilla, active orthopedic wear (2 to 4 hours of daytime wear) is contraindicated. Passive wear or no more than 1½ hours of active daytime wear would be indicated in such a case or the passive wear of a Bionator could be used with growth monitoring.

There are some proponents of functional appliances that state that a change in muscular attachments occurs with the use of these appliances especially in adults and therefore, any degree of overjet can be successfully corrected in adults with no remaining facial growth. At best, without further research this is a questionable procedure[47]. As seen in Figure 9, considerable stress is placed on tooth inclinations for a severe correction in the antero-posterior direction to take place in the adult. The correction with active wear will take place regardless of age but the usual resultant adverse tooth inclination especially of the lower incisors and the significant relapse of the overjet that takes place in the adult makes it a questionable procedure. As a result of the relapse that normally takes place in the adult patient, the Occlus-o-Guide® is not recommended in the non-growing patient unless the amount of overbite and overjet correction is 4 mm. or less. In this way, when the expected relapse takes place, it would be hoped that one or two millimeters of correction would eventually stay. If retention were to be anticipated for the remainder of the patient's lifetime, which is not recommended due to the possibility of constant tooth

movement and mobility, then more severe cases could be corrected. Standard orthodontic treatment of choice in a severe adult overjet.

Bimaxillary protrusion, where both the maxillary and mandibular arches are forward in the face with no overjet, are impossible to correct with functional appliances. These appliances only work to adjust an overjet because of the positional difference between the two jaws. If an attempt were made to position the mandible forward in a bimaxillary protrusion case, a Class III malocclusion would result. On the other hand, if the Occlus-o-Guide® were simply placed in such a mouth, nothing would happen to the jaw relation and it would stay in the same position even with maximum exercise. If a head-gear and lower bumper were placed in conjunction with the Occlus-o-Guide® appliance, the entire dentition could be retracted but only about 2 mm. and there would be little or no observable change in the soft tissue profile with this treatment procedure.

Review

A clinical description of the use of the Myofunctional Eruption Guidance Appliance (Occlus-o-Guide®) has been given specifically in the correction of overbite and overjet in the mixed-dentition stage. The appliance can be used in the correction of overbite ideally worn 2 to 4 hours daily with exercise and passively at night during this period immediately following the exfoliation of the mandibular deciduous canines and prior to the full eruption of the lower permanent canines. The least amount of overbite relapse is usually seen when the appliance is properly timed in this way. The treated overbite is retained with one hour of exercise per day and worn passively at night as few days per week as it takes in order to properly retain the overbite. As soon as the overbite is stable, appliance wear is discontinued which is usually after one year.

Moderate overjets (6 mm. to 9 mm.) should ideally be timed to be corrected somewhere between 10½ to 14½ years of age in the male and between 8 to 11½ years of age in the female. Severe overjets over 10 mm. should be corrected ideally prior to 9½ years of age in the male and 7 years of age in the female. Minor overjets of 5 mm. or less can be corrected at any age and even in the adult. Overjet is retained as little as possible depending on the remaining growth of the individual and night-time only passive wear is usually enough to properly retain a corrected overjet.

A discussion of the use of the Myofunctional Eruption Guidance Appliance in the preventive correction of crowding, spacing, rotations, cross-bites, molar relations, midline discrepancies and TMJ correction will be discussed in a future article.

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Fig. 1 (a) To estimate the appliance size, place the pointer even with distal surface of the left upper or lower lateral incisor, (b) bring the gauge even with the incisal edges to the right side and read the size even with the distal of the lateral and (c) select the indicated size and insert into the mouth.

Fig. 2 (a) Initial deep overbite corrected at rate of 1.25 mm. per month. (b) shows corrected overbite at 9 months from start of treatment. Occlus-o-Guide® appliance not worn after this stage. (c) Twenty-one months of no retention showing ability of overbite to retain, probably due to collagenous fiber formation following eruption of several posterior teeth.

Fig. 3 (a) Initial deep overbite with rotations, crowding, and axial inclination problems corrected to (b) after 11 months and the occlusion being guided into place to (c) after another 5 months of eruption guidance.

Fig. 4 (a) Initial severe overjet and overbite corrected to position shown at (b) after 11 months of active wear and 17 months of retention with final perfect overbite and overjet finished at least 12 months prior to start of pubertal spurt (SA 11 yrs. 6

months) with no additional clearance to compensate for the possibility of a release

of increased mandibular forward growth accommodation due to the permanent elimination of the possible inhibiting effect of the overbite and (c) one year after completion of the pubertal spurt (CA 17 yrs. 2 months) showing and end-to-end anterior occlusion.

Fig. 5 (a) Severe overjet to be corrected prior to the full eruption of the upper right permanent canine with minimal space for the canine, (b) shows wires (.020" round) in place on either side of the space to be preserved or slightly opened and (c) with the appliance in place in the mouth.

Fig. 6 A cervical head-gear in place in buccal tubes (.045") in maxillary molar bands on the first permanent molars together with the Occlus-o-Guide® in place. If the head-gear is ahead of the labial section of the Occlus-o-Guide® by 2 to 3 mm., it will move the posterior teeth distally independently of the effect of the Occlus-o-Guide®.

Fig. 7 (a) A minor overbite and overjet corrected to perfection (b) in 8 months and even in such a minor case shows similar orthopedic changes (c) of restricted maxillary growth in the same way as that seen in the most severe cases.

Fig. 8 (a) A severe initial overjet corrected in 3 months to (b) and showing cephalo-metrically (c) no change in the lower incisors after 47 months due to the patient being started with 32 months left before all facial growth was complete.

Fig. 9 (a) A severe initial overjet in a female started 3 years after completion of most facial growth (SA 16 yrs. 0 months) showing dramatic improvement (b) in 8 months while cephalometrically (c) the lower incisors have been tipped dramatically in a labial direction (7°) due to lack of facial growth.

Fig. 10 (a) A severe overjet with severely labially-tipped maxillary incisors usually results in an optimum result (b) with properly uprighted incisors (with 11 months) that are not too lingually inclined. The appliance (c) even though it does not fit at all to the upper incisors initially places a strong distalizing force that quickly closes the spaces and tips the incisors lingually.

Fig. 11 (a) The profile of the patient indicates a protrusive maxilla and a recessive mandible. A cervical head-gear was combined with the Occlus-o-Guide® to provide a dramatic change in the severe overjet and overbite (c) to the interim result (d) and a dramatic facial change (b). The maxillary incisors had fixed appliances applied to create the necessary lingual root torque (e).

Fig. 12 The head-gear is also helpful in creating the required space for the Occlus-o-Guide® to properly straighten a severely crowded case (a) with more than 3 mm. of shortage to give a dramatic result (b) with only nighttime wear.