

BUMPERS II – Arch Expansion, Distalization and Anchorage Protection

Bumpers, or more technically called labial vestibular appliances, have traditionally been used to distal-drive lower molars and to protect the "anchorage" of the posterior segments in the lower arch. With the development of several modifications to the bumper its usefulness can be enhanced greatly.

A. As arch-development appliance - One of the greatest uses of the bumper is to combine its capabilities as a distalizing appliance against the molars in combination with expansion. This can be done in two ways, namely, in combination with wire extensions from molar bands that expand the canine-molar segment with progressive arch width increases in the posterior portion of the bumper. When the molar lingual wire-extension is engaged into the mesial surface of the canine, the distalizing force of the bumper opens up space mesial to the canine, which provides needed room for the incisors in crowded cases. This procedure can be done at any age, but the expansion is best done while the deciduous molars and canines are still present. The reasoning behind this is that the cortical plate of bone once it is formed on the buccal surface of the permanent bicuspid and canines can possibly be resorbed with expansion of these teeth together with a high incidence of lingual relapse. This is also compounded by the relative lack of remaining eruption at this stage and when teeth are tipped buccally, they do not upright themselves with buccal root torque as teeth do when they erupt over a great distance into the mouth at an earlier stage. According to studies on early expansion, up to about 3 mm can be expected to remain following expansion treatment in the canine area or about what will normally occur with normal forceful tooth eruption with incisal and canine emergence. Therefore, it is not recommended that expansion beyond this amount be attempted in the lower arch. This, together with 4 mm of additional deciduous mandibular tooth material (2 mm each side) over that present mesio-distally in the permanent bicuspid and canines, affords the possibility of approximately 7 mm of arch shortage in the anterior segment or the width of one tooth. Another 2 mm can be gained by distal driving the first permanent molars on each side, however, the poor prognosis of gaining more than 9 mm of shortage precludes ambitious increases greater than this amount.

Arch shortages of up to 4 mm in the upper or lower can easily be corrected by simply stripping or disking the mesial and distal surface of the deciduous canines and the mesial surface of the deciduous first

molars when needed. The "G" series appliance should not be started to correct this crowding until this stripping is done, otherwise the reduction of crowding will displace the incisors anteriorly. This is particularly contraindicated in the lower arch when there is a thin mandibular body labio-lingually, a tendency for long incisal clinical crown heights, or low (or thin) gingival tissue when it is felt that the lower incisors cannot stand movement in the labial direction. Excessive lower facial heights also are usually a contraindication since the mandibular body is very thin labio-lingually and has particularly fragile labial gingival tissue and bony support of the incisors.

Arch shortages of more than 4 mm up to 7 or 8 mm can be accommodated but with some additional aid from either distalization of the molars and/or arch expansion in the buccal segments. The treatment objectives in these crowded arches, whether they are potentially crowded deciduous dentitions prior to the eruption of the permanent incisors or after the permanent incisors have already erupted, is to create enough room from the mesial of the deciduous canine from one side to the other so that the four incisors can have enough room for their eruption or be orthodontically aligned within the space created without their being displaced anteriorly (especially in the lower arch so as not to adversely alter their labial bony and soft tissue support). According to those studies dealing with the expansion potential of the arches, especially in the lower arch, the bicanine width cannot be expected to be expanded and permanently remain expanded beyond the width increases that normally take place during dental development with the eruption of the permanent lateral incisors (1.5 mm) and the permanent canines (1.5 mm). Greater arch expansion at the deciduous bicanine area cannot usually be tolerated and permanently remain. Therefore, there seems to be a limit beyond which further expansion of the lower arch is not possible. The distalization of molars with the use of labial bumpers seems also to be limited to about 2 to 3 mm per side in the lower arch without the extraction of second (or third) permanent molars.

The limits of buccal arch expansion and molar distalization seem to be about the width of one tooth or about 6 to 8 mm. Beyond this amount, it becomes very difficult to obtain good arch form without the extraction of permanent teeth. There are, at times, exceptions to these principles, especially in cases with lingually-tipped buccal or labial segments and those individuals with particularly widely spread buccal and lingual cortical plates with wide troughs for the posterior tooth segments that perhaps tolerate greater arch expansion. Individuals with short and wide lower face heights (Brachycephalic) at times fit into this category. Therefore, clinically up to 4 mm of anterior incisal crowding can be accommodated with stripping or disking of the deciduous canines (or first deciduous molars) and guiding the erupting incisors into the ideal arch form with an early Nite-Guide® (C series) or if the disking is done after the incisors are fully erupted then the incisors are rotated and aligned into the newly created space either by the standard "G" series or by standard orthodontic tooth movement (with brackets, arch wires, etc.). From 4 mm up to 7 mm, arch expansion is recommended by widening and distal driving the buccal segments about 3 mm in both directions and opening the space mesial to the deciduous canines. The earlier this is

done, the greater chance for probable success since larger increments of vertical alveolar development remain for the child and the eruption of permanent teeth (bicuspid and canines) will allow their roots to position themselves vertically (in a bucco-lingual direction) without lingual root torque or buccal crown torque as is frequently seen when expansion is done after these permanent teeth have already erupted into place. Buccal expansion in a long-faced child (Dolichocephalic), in spite of greater increments of vertical alveolar development, should probably be limited to smaller amounts due to the inherited or developmental narrowed mandibular body and buccal troughs for the erupting posterior teeth. Extraction of teeth, therefore, is more frequently resorted to in the long-faced child with crowding for this reason, together with the more wedge-shaped free-way space and the inadvisability of distal driving posterior teeth and risk of propping open the jaws and creating an increase in anterior face height. The relatively weak masseter closing force in these individuals (40 to 100 pounds per square inch) will usually result in less relapse of this adverse opening of the jaws and can leave the lengthened lower anterior face height as a permanent disfiguration.

1. Fitting the standard bumper in the mouth. The bumper can be used in either the lower or upper arches, however, the lower arch is usually more common because of the great frequency of mandibular crowding. When maxillary incisal crowding is extreme, the fixed rapid palatal expansion appliance is frequently used prior to suture closure in the maxillary and palatal bones in order to gain space directly within the incisal area and at the same time gain buccal arch expansion. If there is minor maxillary incisal crowding and expansion of both upper and lower arches is desired as well as distalization of the upper and lower posterior segments both upper and lower bumpers can be used. Having both bumpers in at the same time has the advantage of expanding both the maxillary and mandibular arches simultaneously, since one cannot usually successfully expand one arch (e.g. lower) and have the opposing arch (upper) expand with it automatically. In minor lower expansion, the "G" series appliance can usually provide for upper and lower coordination without the creation of a tendency of the upper to develop into a lingual cross-bite with the lower arch.

Two types of bumper attachments are available. One is to have the bumper simply attach to lower molar bands through .045 inch gingival buccal tubes and the other is to have the molar band have a lingual extension that engages the mesial of the deciduous (or permanent canine). The object of this configuration is to gain space in the incisal segment as expansion and distalization occurs with the bumper. Simple expansion (without distalization and concentration of the expansion in the area mesial to the canine) usually is extremely inefficient since

the posterior segments move laterally and anteriorly as expansion takes place. Great amounts of expansion in this way usually create small amounts of anterior incisal space mesial to the canine. When large amounts of expansion are made, the lingual extension wire at times requires a bend mesial to the molar to move the anterior end of the wire gingivally so it doesn't ride incisally up the slanted lingual surface of the canine. This is accomplished with a 3-prong pliers inserted just mesial to the molar with the double prongs occlusally. A very slight crimp moves the wire gingivally and will usually last for a few appointments of continued expansion.

The bumper is checked for size on the plaster study cast or in the mouth. The buccal and labial section should be about 2 mm away from the soft tissue or teeth from molar to molar. The left end of the bumper is inserted into the left lower molar tube first and the right side is checked outside the tube to see if it is parallel vertically and horizontally. Next check to see that the bent stop is immediately in front of the tube and see if the whole bumper falls about 2 mm outside of the soft tissue, particularly from distal of canine to distal of canine. The vertical level of the anterior segment of the bumper should be as low as possible without digging into the muco-buccal fold gingival to the incisors. If this is acceptable, insert the end of the right side of the bumper into the tube. If it doesn't slide in easily, don't force it. Adjust the end until it slides in easily. Often the bumper can be squeezed together outside of the mouth on the right side in the area of the bicuspid and the bumper should slide in easily. Now check the space between the bumper and the tissues. It should be equally about 2 mm from molar to molar. The vertical loops in the bicuspid areas should also be about parallel to the alveolar tissue so as not to dig into the labial pads. Keep the ends of the bumper that come out of the distal ends of the tubes about 3 to 4 mm long. This allows enough room to advance the bumper labially without having to alter the vertical "Omega" loops. Altering the vertical loops creates insertion problems into the tubes and usually involves several adjustments to return it back to normal. To advance the bumper, it is recommended that a 1 mm weldable stop be tack welded to the bumper wire inserted into the tube to advance the entire bumper either on the left and/or right side slightly. Check the muco-buccal tissue by pulling up on the lip. If the tissue doesn't pull into the bumper when the bumper is as low as it can be, it will usually be in the right position vertically. Next check to see that at normal posture of the lip, the lower lip comes up over the top of

the bumper and rests against the labial portion of the incisal third of the crowns of the lower incisors. The incisors will thus remain upright. This is extremely important since the incisors will migrate labially when the bumper is too high and covers over the entire labial surface of the incisors. If it is desirable to have the incisors move labially because of their excessive lingual inclination, then the bumper should purposely be positioned to cover the labial surface and prevent the lip from touching the teeth. A chain elastic is inserted around the buccal tube before inserting the bumper, then after the bumper is in place the chain is stretched forward around the bumper hook. Remember, the bumper is extremely effective when it is in the mouth all the time. These fixation hooks, when tied in, also prevent the bumper from being lost.

2. Fitting the bumper for expansion. The expansion bumper (same type bumper, but used in a different way) is fitted into the tubes and around the tissues in the same way as the standard bumper. A standard distalizing bumper should be slightly expanded at the distal (1 to 2 mm) to widen the molars slightly as it distalizes to coordinate with the normal morphology of the mandible. When getting significant distalization and expansion, the bumper can be widened by about 3 or 4 mm across the distal. The molar bands have extensions soldered to the lingual (.039 wire) and flattened towards the mesial end to be wrapped around the mesial surface of the canine or first deciduous molar. Molar bands, of course, are first fitted, an impression is taken and the bands are removed and waxed to the impression. Then the lingual wire is shaped to fit against the gingival and lingual running forward to the canine. It is then soldered, then cemented to place in the mouth.
3. Adjustments with bumper use. The distalization of molars is usually not too evident after the first month's wear, or at least you do not usually see any space opening between posterior teeth at this time. What you do see after one month's wear is that the bumper might almost be against the labial alveolar tissue and usually requires advancement. Be sure that the bumper's position anterior to the incisors is re-established so that 2 mm space again exists between tissue and appliance, especially around the canine eminence on both sides. The bumper is advanced by adding .045 weldable stops, usually one on each side in order to advance and bring it forward to about 2 mm labial to the tissue. If one molar is going back faster than the opposite side,

then only one side is advanced. The bumper can be moved forward slightly out of the tube on one side at a time to test which side should be advanced. If when you test the advancement on one side, the bumper fits to the tissue (especially around the canine eminences) by maintaining the 2 mm space better, then advance only that side. If both sides require advancement, the weldable stop is welded on both sides using a tack welder. (A heavy impulse, #3 or #4 weld is tacked once and this will insure that the stop will remain in place.) As the bumper is advanced, it should also be expanded slightly about 1 to 2 mm for each 1 mm advancement in order to accommodate the slightly wider bi-molar width as both molars distalize. When the patient returns after one more month (two months from insertion) a space is usually evident mesial to the second deciduous molar unless lingual extensions are wrapped around the mesial of the canine in which case the space will occur in this area. It will also usually be evident that the overbite will decrease in the incisal area by about 1 to 2 mm. Again, the same procedure should proceed with a 1 mm stop added on each side per month for about 3 months.

One must be cautioned to check the position of the erupting permanent second molars before proceeding with a bumper. There should be a space mesial to the erupting second molar crown, between it and the distal of the first permanent molar. Ideally, the second molar crown should be inferior to the area of the cemento-enamel junction of the distal surface of the first molar. An intra-oral is better than an Panorex or a bite-wing X-ray film to verify this. At times the crown of the second molar looks like it touches or overlaps the first molar on the bite-wing or Panorex, while on the intra-oral it often indicates a 2 mm space on the same patient. If the second molar crown at its occlusal surface is touching and is caught in the depression of the cemento-enamel junction of the first molar, it would be wise to wait a few months until the second molar crown erupts a few millimeters. When the crown is a couple of millimeters occlusally of the cemento-enamel junction, then there is little danger of impacting the second molar with the first molar distalization. If both crowns are in place (first and second permanent molars) the bumper will adequately distalize both teeth when the force is exerted against the band on the first molar. The same diagnostic criteria, however, is applied in a similar way to the lower third molar crown in relation to the second molar and to the first permanent molar to the second deciduous molar.

When second permanent molars are extracted, the distalization potential of the first permanent molar is increased considerably and will also usually allow the third to erupt in an upright position. In fact, in the adult, up to 6 or 7 mm of crowding can easily be accommodated prior to the eruption of the third molars. In the use of the bumper in the upper arch, one does not have to be so concerned with the potential impaction of the upper second molars since their eruption path is not usually in an anterior direction like the lower molars.

If the deciduous second molars have recently exfoliated and the first permanent molars have drifted forward through the "leeway space", the first permanent molar can quite easily be moved back to its previous distal position if it has not been in its mesial position by more than about 6 months. Following this 6 months, the collagenous fibers are probably more heavily developed and the second permanent molar is probably more erupted and the procedure takes more continued advancement. The distal driving effectiveness of the bumper is enhanced considerably when it is combined with the "G" series appliance with active clenching exercises in order to correct crowded incisors. Up to 5 mm of anterior crowding can be effectively corrected without expansion when the appliance is combined with the bumper. The distalization evidently is retained each day by the forceful anterior correction of the crowding by the "G" series which helps to prevent any forward relapse of the molars. This is especially evident when the patient wears a bumper full time or when using the head gear in the upper arch for 8 to 12 hours per night.

3. Uses of the bumper.

(a) The earliest age where a bumper can be practically used is at about 4 to 6 years of age. At this age it is most often used to gain room for crowded erupting lower permanent incisors. The bumper is usually attached to the lower permanent (or upper) first molars in order to simply distalize or to expand the arches. The bumper can also be attached to bands on the second deciduous molars, but the potential impaction of the first molars (usually lowers) must be watched as previously discussed for the second permanent molars impaction possibility. The most distalization that one would anticipate would be to gain about 3 mm per side and with lingual wire extensions added to the molars could concentrate that gain mesial to the canines on each side. This will accommodate approximately 7 to 8 mm of potential lower incisal crowding during the transition of the incisor eruption at 6 to 7 years of age. The patient

will ideally get about 3.5 mm of widening (canine to canine) from forceful eruption of unrotated permanent incisors, together with another potential 3.5 mm from artificial preventive stripping of the canines and deciduous first molars. One problem that arises with lower crowding is that the lower centrals erupt rotated in order to occupy lost room between the deciduous laterals, and when the permanent lateral erupts on one side, it makes room for itself by pushing the centrals to the opposite side as the other deciduous lateral exfoliates. When the last remaining permanent lateral tries to erupt, it is completely crowded out and is displaced usually to the lingual. The collagenous fibers form and hold all four incisors in their crowded position and it later becomes a major orthodontic procedure to properly align these teeth and place adequate root torque on the lingually-displaced lateral. This tooth, once straightened, always has a tendency to relapse lingually, even with a circumferential fiberotomy. The potential preventive treatment procedure with the standard or expansion bumper is to create about 4 mm of space mesial to the two deciduous canines prior to the eruption of the permanent centrals. When the centrals erupt, there will be enough room for their eruption. The Nite-Guide® can then be used to guide the incisors in properly. As the laterals erupt, the disking or stripping of the deciduous canines and deciduous first molars can be done which will give an additional 4 mm (2 mm on each side) across the anterior segment. When the four permanent incisors fully erupt they should be perfectly straight and in almost the same labio-lingual position as the deciduous incisors. Levels of the gingival tissue of the lower permanent incisors should be normal and if it is seen that it is lowering it is a sign that the teeth are too labial in position and either greater room should be made for the teeth as they erupt or the bumper might be positioned too far incisally and can result in labial displacement of these teeth. If too much crowding is evident and no more expansion is possible, the teeth might be allowed to be slightly rotated to reduce the risk of gingival recession. If, when treatment begins, particularly at a later age after the incisors have fully erupted, and it is seen that the gingival tissue is already low on labially-positioned incisors, it is recommended that a free palatal graft be placed prior to any tooth movement.

(b) Once the incisors erupt, the next stage to use the standard or expansion bumper is from about 6 to 11 years of age. It is used to distal drive molars and/or expand the posterior segments. The only difference between this stage and

the previous stage (prior to and during the eruption of the incisors) is that now the incisors have to be physically moved into proper alignment either with the "G" series appliance or with fixed appliances. If this is done quickly after the incisors are fully erupted (e.g. within six months) very little effort is required for their straightening or retention. Frequently this requires only nighttime wear with the "G" series or perhaps at the most one hour of exercise per day, while after the teeth have been in the mouth for 2 years, it takes a minimum of 2 hours per day to obtain the same correction. Also, at the later stage, one has to be more cautious in their retention and frequently a fiberotomy may be necessary for stability. When the incisors are guided into the mouth as they erupt, little or no retention is required. At the most, passive nighttime wear will easily retain the rotations.

As the use of the bumper approaches the time when the bicuspid, canines and second permanent molars are erupting, one must be careful not to impact the second molars and to excessively expand the posterior segments. It is generally felt that expansion done after the full eruption of the bicuspid and permanent canines will usually relapse or might possibly erode the buccal cortical bony and soft tissue support of these teeth. Distalization of the molars at this stage also is usually not as successful as the same procedure at an earlier age. The bumper works as well but the distalization usually relapses. It has been stated that distalization of molars after the bicuspid, canines and second molars are fully erupted in the mouth does not usually create a stable result since the molars frequently relapse back to their original anterior position. Therefore, as the permanent dentition is established and the collagenous fibers become thickened following several months after the full eruption of the bicuspid, canines and second molars, there is little potential of the bumper to be used as an expansion appliance, but it can be used as a distalization appliance if adequate room is provided distal to the molars, such as being provided through the extraction of the third or second permanent molars. The extraction of the second permanent molars with the use of the bumper affords great opportunities at this stage to correct up to about 5 to 7 mm of anterior crowding quite effectively.

(c) To distal drive the first permanent molars with the extraction of the second molars, can be done effectively at this age, however, it is extremely effective in the young adult (14 - 20 years of age). One must be sure that

the third molars are present, of adequate size to take the place of the second molars, and in a position to erupt into place without laying over into a horizontal position. The procedure is usually most successful while the third molars are normally in their eruptive state. The alignment of the anterior crowding can be accomplished by the use of the active "G" series appliance or with fixed appliances.

(d) A bumper can be placed as a space maintainer to counter the effects of second molar eruption, to maintain the distal position of the first molar (especially in the lower arch) while the permanent second molar erupts. The additional space of about 2 mm per side can then be utilized to provide extra space for erupting permanent teeth (bicuspid and canines). When all of the permanent teeth mesial to the first molars are fully erupted, the bumper is maintained in place while the second permanent molars erupt into place. This procedure keeps the whole posterior dentition in a more distal position (2 mm more distal on each side) than otherwise would be possible if the bumper was not used. It is particularly helpful in this manner when the second molar starts erupting prior to the full eruption of the bicuspid and canines. It prevents the loss of valuable arch length needed for the eruption of the bicuspid and canines. It prevents the loss of valuable arch length needed for the eruption of the bicuspid and canines after the deciduous canines have been disking 2 mm on each side at an earlier period in order to make room for crowded incisors. Once the second permanent molars are fully erupted for a few months, the bumper can be removed. In this way, the formation of heavy adult collagenous fibers will aid in the distal retention of the arch.

(e) The bumper can be used as an anchorage unit during non-extraction orthodontic treatment. The appliance is most useable during non-extraction therapy in order to stabilize the position of the lower arch while using Class II elastics to retract the upper arch. This procedure protects the upright position of the lower incisors and prevents the labial proclination of these teeth and resultant loss of alveolar and soft tissue support of these teeth with careless use of Class II elastic mechanics against the lower arch and resultant loss of anchorage. As long as the elastic forces do not exceed 3 to 4 ounces, the anchorage will not slip in 83% of the cases. If the bumper is used alone in the lower arch, it is important to position the bumper low enough so that the lower lip comes up over the bumper and touches the incisors to prevent their labial

movement. In order to obtain this anchorage preparation, it is recommended that the lower first molars be distalized 1 mm on each side for one month at the start. After this initial preparation, elastic force can be used for as long as necessary. If labial movement of the lower incisors is desired, the anterior shield of the bumper is elevated to lift the lip away from the incisors.

(f) The bumper can be used as anchorage protection in bicuspid extraction orthodontic cases. When it is found that the molar areas are moving forward too fast in an extraction case and there is fear that the canines will not retract far enough to properly correct the crowded incisal segment, a bumper can simply be inserted and the first molars immediately stop their mesial movement with the use of retracting forces (such as pull coil springs, chain elastics, elastic thread, etc.) and remain in place while further canine retraction is made. Again, it must be remembered that the retraction forces should not exceed 3 to 4 ounces per side. If the forces exceed this, anchorage of the molars will usually be lost. Total force against the molars is what is important. Both Class II elastics and retraction forces used simultaneously will usually exceed the anchorage protection amount of 3 to 4 ounces and will allow the molars to slip forward.

(g) The bumper can be used to regain space in a relapsed orthodontic case. A bumper is capable of regaining space for a relapsed orthodontic case where recurrent anterior crowding has occurred. It is, however, questionable whether this procedure can give a permanent result without possibly gaining some distal stability by a circumferential fiberotomy on the posterior teeth. Probably the greatest stability is obtained when either the second or third molars can be extracted prior to the procedure. When the first and second molars are held back initially, prior to their mesial migration during the mixed dentition, without ever allowing these teeth to move forward through the leeway space, the greatest stability is probably produced. This is probably due to the development of the collagenous fibers as the molars fully erupt.

4. Advantages of the bumper. The greatest advantage of the standard bumper is that it gains its distalizing force outside the dentition, thereby not producing an opposite or reactive force in the dentition. It can be used at most ages with equal results and can be used in the lower and upper arches. It provides bodily distalizing force with a very small tipping vector, provided the buccal tubes for

the bumper are placed gingivally and the anterior shield is positioned as far into the muco-buccal fold as possible. Additional mesial forces can be used against the bumper such as retractive forces or Class II elastics without any mesial slippage of molar positions in 83% of cases. As an expansion appliance, it does not depend on cooperation since it can be tied in place making removal impossible. It can expand either upper or lower posterior segments and both can be in the mouth at the same time. It can be used as previously mentioned to protect anchorage, distal drive posterior segments, create room for crowded teeth and/or erupting teeth, prevent mesial migration of the first permanent molars through the leeway space, create labial movement of lower incisors if that is desirable, or prevent the same during anchorage taxing procedures.,

The disadvantages are that it can impact second or third molars if certain precautions are not taken. It can cause abrasion of soft tissue over the canine eminence or sore spots if the patient isn't observed monthly and the appliance is not adjusted at each visit by advancement and/or adjustment. Also, after several months of use the molar tubes can become slightly enlarged and the fit of the bumper is not as tight as at the beginning and there develops some unwanted vertical movement, but usually of no adverse consequence.

5. Different types of bumpers. There are several types of bumpers available. One simple type is a single .045" round wire from molar to molar, frequently with a round plastic sheath around the wire in the anterior segment. The major disadvantage of this type of bumper is that it cannot distalize molars, although it is fairly capable of protecting anchorage in most orthodontic anchorage-taxing procedures (although the bumper with the pad is a safer anchorage control device). There is the type of bumper with a pad across the anterior segment which is an advantage in that it is capable of distal driving the dentition. These standard types of bumpers may have an omega loop on the side in the area of the canine or first bicuspid. The advantage of this loop is that the posterior extension of the bumper wire can be lengthened if needed as the advancement takes place and naturally shortens the end of the wire. A bumper from Ortho-Tain[®] has an added advantage of being preformed to more accurately fit the patient's mouth and molar tubes with minimum alteration and cuts down on the amount of custom fitting normally required of other brands. It also has a molded hook that secures the bumper to the

molar band with a chain elastic and eliminates cooperation problems. In combination with the "G" series and the Nite-Guide® appliances, the effects of arch development, preservation of posterior deciduous arch spaces to facilitate eruption of crowded permanent anterior and/or posterior teeth, creation of space for crowded permanent dentitions, as a single arch replacement for other double (upper and lower) expansion appliances that cannot be worn at the same time as the "G" series appliance. As a method of speeding the overbite correction, these new bumper designs serve as a valuable addition for more effective preventive, interceptive and treatment procedures.

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