**About the Authors**

Dr. Richard McLaughlin - San Diego, California

Dr. Richard McLaughlin completed his orthodontic training at the University of Southern California in 1976. Since then he has been in the full time practice of orthodontics in San Diego, California. While developing his own practice, he was an associate of Dr. Lawrence F. Andrews for seven years. Dr. McLaughlin has lectured extensively on the pre-adjusted appliance system, and with Dr. Lawrence F. Andrews for seven years. Dr. McLaughlin has held a particular interest in evaluating and refining effective treatment mechanics utilizing light forces. These concepts have developed and have included the more recent contribution from Dr. Trevisi. Their well tried and effective treatment approach has seen widespread acceptance. Dr. McLaughlin has lectured internationally on the pre-adjusted appliance system for a number of years. Together with Dr. McLaughlin he has published numerous articles and has co-authored two orthodontic textbooks, both of which have been well received. He is currently a part-time clinical instructor at the post-graduate orthodontic program at Bristol University in England.

Dr. John Bennett - London, England

Dr. Bennett completed his orthodontic training at the Eastman Dental Institute in London, England in 1972. Since that time he has been in the full time practice of orthodontics in London, England. For the past 20 years he has worked exclusively with the pre-adjusted appliance system, and with Dr. Lawrence F. Andrews for seven years. Their well tried and effective treatment approach has seen widespread acceptance. Dr. McLaughlin has lectured internationally on the pre-adjusted appliance system for a number of years. Together with Dr. McLaughlin he has published numerous articles and has co-authored two orthodontic textbooks, both of which have been well received. He is currently a part-time clinical instructor at the post-graduate orthodontic program at Bristol University in England.

Dr. Hugo Trevisi - São Paulo, Brazil

Dr. Hugo Trevisi received his dental degree in 1974 at Lins College of Dentistry in the state of São Paulo, Brazil. He received his orthodontic training from 1979 to 1983 at that same college. Since that time he has been involved in the full time practice of orthodontics in Presidente Prudente, Brazil. He is a Faculty Member at the University of Odontology and Dentistry in Presidente Prudente. He has lectured extensively in South America and Portugal and has developed his own orthodontic teaching facility in Presidente Prudente. Dr. Trevisi has 20 years of experience with the pre-adjusted appliance. He is a member of the Brazilian Society of Orthodontists, the American Association of Orthodontists, a Diplomate of the American Board of Orthodontists and a full member of the Edward H. Angle Society. In addition, Dr. McLaughlin is an associate clinical professor at the University of Southern California, Department of Orthodontics.

**A Clinical Review of the MBT Orthodontic Treatment Program**

*By Dr. Richard McLaughlin, Dr. John Bennett and Dr. Hugo Trevisi*

**MBT Treatment Philosophy**

The MBT philosophy of orthodontic treatment has been developed over a twenty year period of time and has involved the combined efforts of its three principle clinicians, along with the help of numerous other clinician colleagues. Their philosophy places emphasis on four critical areas of orthodontic treatment: 1. Treatment mechanics, 2. The pre-adjusted appliance, 3. Bracket placement technique, and 4. Arch form and archwire sequencing.

The MBT philosophy is supported not only by a custom designed appliance, but also by worldwide continuing educational opportunities as well as a long awaited textbook.

**Overbite Control**

Overbite control is best accomplished by using the following principles:

- **Differentially controlling the eruption/extraction (invasive and extrusive forces) of the anterior and posterior segments**
- **Including second molars early in treatment for the opening of most deep bite cases**
- **Being aware that in most cases leveling and bite opening are not complete until rectangular wires have been in for one or two months**
- **Avoiding leveling of the posterior portion of the Curve of Spee in open bite cases**

**Space Closure**

Space closure is best accomplished by using the following principles:

- **A .019 x .025" rectangular wire in the #22 bracket slot is preferred for effective sliding mechanics without major archwire deflection**
- **Sliding mechanics is accomplished with elastic module tie backs**
- **Incisor torque control is accomplished through bracket design and archwire bending**

**Overjet (Class II Class III Correction)**

Class II and Class III correction is accomplished by using a combination of headgear, Class II and Class III elastics, and functional appliances. These appliances are used in combinations that bring about the best opportunity for continuous forces on the dento-alveolar processes.

**The MBT Philosophy of Orthodontic Treatment in Practice**

**1. Treatment Mechanics**

Emphasis on dento-alveolar change

The major effect of orthodontic treatment is on the dento-alveolar structures. Thus the term “growth modification” in growing patients consists primarily in the modification of the growth and development of the dento-alveolar processes. While other “orthopedic” changes may be occurring in some patients, the majority of change is dento-alveolar, and, therefore, emphasis is placed on the management of these structures.

Use of Light, Continuous Forces

Intermittent forces have proven to be relatively ineffective in bringing about dental tooth movement; on the other hand, continuous forces are most effective in moving dental structures. Heavy forces have been shown to have a detrimental effect on the root structure while lighter forces have been shown to maximize biologic response and efficacy in tooth movement. Therefore, treatment planning is directed at providing light continuous forces on the teeth that need to be moved at any given time during orthodontic treatment.

**Anchorage Control**

A combination of extra-oral (facebows and “J” hooks) and intra-oral (palatal bars, lingual arches, Class II elastics, Class III elastics, Nance arches, utility arches, etc.) methods of anchorage control are utilized in the MBT system.

**Leveling and Aligning**

The leveling and aligning stage of treatment consists of the following techniques:

- **Use of Nitinol Heat-Activated nickel titanium wires during the aligning process**
- **The use of canine lace backs for cuspid control and retraction**
- **The use of bend backs to control forward movement of incisors**
- **The use of open coil springs to create space for blocked out teeth**
- **Early establishment and maintenance of arch form, followed by bringing malposed teeth into the primary arch form without arch form distortion**

**Text Book**

**MBT Appliance**

**Text Book**

**MBT Philosophy**

**MBT Appliance**

**MBT Continuing Education Seminars**

**MBT Appliance**

**Text Book**

**MBT Philosophy**

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Finishing

Finishing involves three main processes:

- The correction of mistakes made earlier in treatment (bracket positioning, torque control, anchorage control etc.)
- Overcorrection as needed (periodontal, alveolar-sutural, muscular, and growth)
- Setting of cases in light wires for approximately six weeks (minimum) prior to debanding

Retention

Retention is accomplished using a combination of bonded retainers for the lower anterior segment, wrap around upper retainers to allow for continued lower anterior segment, wrap around retention for the patient's short clinical crowns. Steel bracket, as evidenced by the figure, is recommended for approximately six weeks (periodontal, alveolar-sutural, anchorage control etc.)

2. MBT Appliance Bracket System

Victory Series™ Brackets - Figures 1, 2, 3 show a good candidate for this small steel bracket, as evidenced by the patient's short clinical crowns.

Clarity™ Brackets - Figures 4, 5, 6 show Clarity metal-reinforced ceramic brackets on her upper teeth, aesthetic brackets for an aesthetic appearance during treatment.

Full Size Twin Brackets - Figures 7, 8, 9 show a patient with large teeth, a difficult malocclusion and poor hygiene. The larger bracket will maximize base surface area and increase control.

Editor: What role does the tapered, ovoid and square wire arch forms play in preventing relapse?

Dr. McLaughlin: With the edgewise appliance, most orthodontists customized archwires to the patient's arch form. When the pre-adjusted appliance was developed, there seemed to be an unwritten assumption that one specific arch form needed to be used for that system, and that arch form was the most appropriate.

After twenty years of using the pre-adjusted appliance, it is apparent that customizing the arch form to the individual patient is what is really most important. Failure to do this will result in relapse. In and out dimension covered some problems, but not all of them. What I would like to see is a return to a customized arch form for each patient without the need to overstock office inventory or waste time in unneeded wire bending. This seems to be the best method of efficiently achieving stable and esthetic end results.

REFERENCES


This seminar presents a discussion of the McLaughlin, Bennett, Trevisi (MBT) philosophy of orthodontic treatment. State of the art mechanics using light continuous force systems are described in detail. The newly developed MBT Versatile+ Appliance, designed specifically to coincide with and enhance the treatment mechanics, is also presented. The six stages of orthodontic treatment are reviewed using the sequential demonstration of a variety of case reports. This is a practical and very clinically oriented program, which will provide information that is immediately useful for the modern orthodontic practitioner.

Inter-Arch Treatment Mechanics - Available in 1998

This seminar is a natural progression of the “New Concepts” seminar. The principles of intra-arch treatment mechanics are covered and applied to the management of cases requiring attention in the area of inter-arch management. It is the efficient management of intra-arch factors that allows the orthodontist to focus on the challenging aspects of inter-arch management. Considerations include the far more difficult challenge of placing the upper and lower dentitions in three planes of space within the facial complex so that they are esthetic, fit properly during static centric occlusion, allow the condyles to be seated into a centric relation position within the glenoid fossae in this static position, and function from this static position without interference during lateral and protrusive movements. Thus, inter-arch considerations include such factors as growth and development, and the management of vertical, horizontal and transverse skeletal and dental discrepancies. The subjects of Class II, Class III and Asymmetrical treatment areas are also discussed.

Management of the Dentition - Available in 1998

This seminar describes the management and correction of specific dental problems involving each individual tooth. Thus, specific clinical situations related to incisors, cuspids, 1st and 2nd bicuspids, and 1st, 2nd and 3rd molars are discussed. The extraction versus non-extraction issue is reviewed in detail. The seminar will also provide an in-depth review of the material in Dr. Bennett’s and Dr. McLaughlin’s newest textbook, Orthodontic Management of the Dentition with the Preadjusted Appliance.

Occulsion and the TMJ in Orthodontic Treatment

Correction of malocclusion to a position in which the condyles are in the correct position can be likened to the proper construction of a house’s foundation. Without it, the house is subject to future instability, as is the malocclusion treated to the incorrect condyle position. This seminar presents a comprehensive review of the management of orthodontic patients with Temporomandibular Disorders. The concept of ideal occlusion is discussed as well as its relationship to temporomandibular disorders. The subjects of diagnosis and treatment planning, splint therapy, and post splint management with orthodontic appliances is discussed in detail.

Diagnosis, Treatment Planning and Treatment Mechanics

This seminar brings together the information from the previous four seminars by placing emphasis on the all important area of diagnosis and treatment planning. The topics covered in previous programs are all relevant to this seminar, which looks at a wide variety of treatment situations. Each case is evaluated from a diagnostic point of view, and participants are invited to make their own judgments concerning treatment planning. The treatment which was completed is then reviewed in a step by step manner, with the results being evaluated. Class I, II and III and Asymmetrical treatment options are reviewed as well.

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choices for inter-molar width. Therefore, this area can be easily widened or narrowed for each patient, particularly in the rectangular wire stage of treatment and in the heavier wires just prior to this wire. This of course is much easier to do than constantly adjusting to the anterior aspect of the arch form, which is much more difficult and very time consuming.

Editor: What other methods can be used to aid in the stability of the orthodontic case relative to arch form?

Dr. McLaughlin: Rather than proceeding from rectangular wires to retainers, it is beneficial to allow cases to settle for a minimum of a month and a half in very light wires at the end of treatment. This allows for setting of the arch form to a more physiologic position for the patient, based on the tongue and face musculature. It also allows for vertical settling of the dentition, which is most important. In addition, this use of a bondered anterior retainer allows for some settling of inter-cuspid width without movement in the incisor area.

Editor: You have recently developed a more efficient system of arch wire sequencing by taking advantage of major developments in wire technology. Was this sequence transition made by taking advantage of rectangular wires by taking advantage of multi-strand steel and .014" stainless steel.

The .019 x .025" Nitinol Heat-Activated wire can be facilitated with use of Endo Ice®, followed by tying in with a steel ligature*. Because of rapid cooling, this procedure can be performed quickly and comfortably. (Cf. Newswire article by Dr. Joseph Caruso, Spring 1994)

The remaining wire used is an .019 x .025" rectangular stainless steel. Use of Nitinol Heat-Activated wires in my orthodontic practice has resulted in much less chair time involved in each visit. Secondly, the intervals between patient visits has been slightly increased. Thirdly, tooth movement is actually much more efficient, and as a result, the aligning phase of treatment is completed more rapidly. This in turn allows me to complete overbite control, overjet reduction and space closure sooner in treatment, which in turn allows more time for finishing and detailing of the case, which enhances treatment end result quality.

Editor: Figures 46 and 47 illustrate the six wires replaced by only two wires for the .022 slot MBT Versatile+ Appliance system.

The use of the .016" Nitinol Heat-Activated wire to replace multi-strand and the .024" round wire has been most satisfactory. This initial arch wire can be placed with ease in most cases, and can be retied one or two times at 4 to 6 week intervals.

As Figure 48, 49, 50, 51 illustrate, engagement of a Nitinol Heat-Activated wire can be facilitated with use of Endo Ice®, followed by tying in with a steel ligature*. Because of rapid cooling, this procedure can be performed quickly and comfortably. (Cf. Newswire article by Dr. Joseph Caruso, Spring 1994)

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and bracket slots placed parallel to the buccal groove. (Fig 14a). This makes band positioning more difficult.

When using these 5° brackets, it is frequently necessary to trim band material from the distal of the band. If the 5° brackets are used, the band must be seated more gingivally at the mesial aspect to position bracket wings parallel to buccal groove. (Fig 14a). This makes band positioning more difficult. When using these 5° brackets, it is frequently necessary to trim band material from the distal of the band. If the 5° brackets are used, the band must be seated more gingivally at the mesial aspect to position bracket wings parallel to buccal groove. (Fig 14a). This makes band positioning more difficult.

The authors observed that torque is rather poorly controlled with the pre-adjusted appliance system. This is due to the fact that the torque movement is a difficult one since less than 1mm of contact between the bracket and the archwire must bring about this movement. In general, here lies the greatest challenge to bracket design in the pre-adjusted appliance. In the majority of orthodontic cases, because of this lack of torque control, torque tends to be lost in the upper incisors during overtreatment and space closure. The lower incisors frequently tend to procline forward during Curve of Spee leveling and when eliminating lower incisor crowding. This incisor torque factor, along with the tip and tooth size factors, frequently prevents posterior teeth from fitting into a Class I relationship.

The authors prefer to maintain 2° of mesial crown tip in the lower bicuspids. Angling these teeth slightly forward in this manner moves them more in a Class I direction; 2° of tip is also preferred in the lower first and second molars. This is accomplished in a manner similar to the tip placed in the upper molars. The lower buccal groove lies 2° off of a line drawn perpendicular to the occlusal plane. As with the upper molars, introducing this 2° of tip to the lower molars can be accomplished by placing 0° tip brackets parallel to the occlusal plane. In summary then, the lower buccipus brackets show 2° of mesial crown tip and the lower molar brackets show 0° of crown tip (2° effective tip) with the bands placed parallel to the occlusal surface.

Table 2 Upper Posterior Tip

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<th>Tip</th>
<th>Andrews' norms</th>
<th>Watanabe's data</th>
<th>Sebata's data</th>
<th>Andrews' non-orthodontic norms</th>
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Table 4 Anterior Torque

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Central Lateral</td>
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<tr>
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<tr>
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The MBT Versatile+ Appliance, the Original Straight-Wire Appliance and the Roth Appliance are welcome additions to the MBT system. In the majority of orthodontic cases, because of this lack of torque control, torque tends to be lost in the upper incisors during overtreatment and space closure. The lower incisors frequently tend to procline forward during Curve of Spee leveling and when eliminating lower incisor crowding. This incisor torque factor, along with the tip and tooth size factors, frequently prevents posterior teeth from fitting into a Class I relationship.

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Table 2 Upper Posterior Tip | “Effective Tip is 2°”

For the MBT Versatile+ Appliance, 0° of tip, as opposed to 2° of tip, was selected for all upper bicuspids brackets to place the crowns in a slightly more upright position, (in a Class I direction). It also provides for slightly reduced anchorage needs for the upper arch.

The buccal groove is the reference for crown tip in the upper molars. This buccal groove shows a 5° angulation to a line drawn perpendicular to the occlusal plane. There are two methods of achieving 5° of effective tip in the upper first and second molars.

If a 5° bracket is used, the band must be seated more gingivally at the mesial aspect to position bracket wings parallel to buccal groove. (Fig 14a). This makes band positioning more difficult.

When using these 5° brackets, it is frequently necessary to trim band material from the distal of the band. If the 5° brackets are used, the band must be seated more gingivally at the mesial aspect to position bracket wings parallel to buccal groove. (Fig 14a). This makes band positioning more difficult. When using these 5° brackets, it is frequently necessary to trim band material from the distal of the band. If the 5° brackets are used, the band must be seated more gingivally at the mesial aspect to position bracket wings parallel to buccal groove. (Fig 14a). This makes band positioning more difficult.

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3. Bracket Placement

Prior to the development of the pre-adjusted appliance, edgewise brackets were placed using gauges which set the bracket a specific number of millimeters from the incisal or occlusal tooth surface. When the pre-adjusted appliance was developed, the center of the clinical crown became the vertical reference for bracket placement, and most orthodontists discontinued the use of gauges. The brackets were therefore placed by visually selecting the center of the clinical crown. Unfortunately, this method resulted in significant errors relative to vertical placement. For example:

• Gingival variations, such as partially erupted teeth, labially and lingually (palatally) displaced roots, and gingival inflammation led to placement errors.

• Large teeth (upper central incisors) and small teeth (upper lateral incisors) within the same patient led to obvious inflammation led to placement errors.

• Incisal or occlusal fractures and wear, as well as teeth with extremely tapered and pointed cusps, led to bracket placement errors. (Figure 36)

The use of a bracket placement chart (developed in 1994), as well as pre-adjusted Dougherty gauges, Figures 37 and 38, dramatically reduces bracket placement errors in the vertical dimension. Figures 39 through 44 show placement technique. We have experienced approximately a 50 - 60% reduction in the need to reposition brackets during treatment using this very simple but effective system.

In Figure 16 the MBT ™ Versatile + Appliance provides increased palatal root torque for the upper incisors (a, b), and increased labial root torque for the lower incisors (c), the most common requirements in orthodontic cases.

Upper Cusp, Bicuspid and Molar Torque

Because of these factors there is generally a need for greater palatal root torque of the upper incisors and labial root torque for the upper incisors (Figure 15). For all these reasons, the authors recommend +17° of torque for the upper central incisors, +10° of torque for the upper lateral incisors, and -6° of torque for the lower incisors.

The upper cusp and bicuspid torque values of -7° have proven to be satisfactory in most cases, and have therefore been selected for the MBT Versatile + Appliance. The upper molars, on the other hand, frequently show excessive buccal crown torque with palatal cusps “hanging down” which creates centric, balancing side and working side interferences. For this reason the authors prefer -14° of buccal root torque (Fig. 17a, b, c).

Lower Cusp, Bicuspid and Molar Torque

Table 6 shows torque values for lower cusps, bicusps and molars from Andrews’ non-orthodontic normal study1, two Japanese studies 2, 3, the MBT Versatile + Appliance, the Original Straight-Wire Appliance 4 and the Roth Appliance 5.

There are three reasons for reducing the amount of lingual crown torque in the lower cuspid, bicuspid and molar areas: 1) Since lower cusps and bicuspids often show gingival recession, they benefit from the roots being moved closer to the center of the alveolar process; 2) many orthodontic cases demonstrate narrowing in the maxillary arch with lower posterior segments that are compensated toward the lingual. These
In-out Modifications of the MBT Versatile+ Appliance

It has been observed by the authors that the in-out measurements (including molar rotation) for the original Straight-Wire Appliance™ have, for the most part, proven to be quite satisfactory. With the exception of severe rotations at the initiation of treatment (best handled by space opening in combination with facial and lingual rotation elastics) minimal modifications in archwires need to be made until the finishing stage of treatment. At that time some teeth may need to be over-rotated for stability (using rotation wedges) and first molars may need archwire offsets to complete their rotation.

One important in-out feature that has been added to the MBT Versatile+ appliance is because upper second bicuspid are frequently smaller in size than upper first bicuspid. For this reason, an upper second bicuspid bracket has been provided with an additional 0.5mm of in-out compensation. This will allow for better alignment of central fossae in the upper arch and will also provide for relatively increased mesio-buccal rotation of the upper first molar. When upper second bicuspid are similar in size to the upper first bicuspid, an upper first bicuspid bracket can be used on the upper second bicuspid.

• Figure 20 A patient in need of posterior buccal crown torque.

MBT Appliance Versatility

• Inversion of upper lateral incisor brackets (Fig. 23, 24, 25). This is beneficial in cases with palatally displaced laterals requiring labial root torque for proper stability.

• Figure 21 An upper second bicuspid bracket with an additional 0.5mm of in-out compensation is provided for the common situation in which upper second bicuspid are smaller than upper first bicuspid.

• Same tip and torque in upper first molar.

• Lower second molar bands and brackets on lower first molars. When the buccal cusps of upper first molars impinge on the bracket of the lower first molar, the use of the lower second molar band with a much lower occlusal profile bracket often eliminates this problem.

• Inventory identification. This is vastly simplified by the pre-labeled individual blister packs of the APC™ Adhesive Coated brackets used in the operatory.
In-out Modifications of the MBT Versatile+ Appliance

It has been observed by the authors that the in-out measurements (including molar rotation) for the original Straight-Wire Appliance™ have, for the most part, proven to be quite satisfactory. With the exception of severe rotations at the initiation of treatment (best handled by space opening in combination with facial and lingual rotation elastics) minimal modifications in archwires need to be made until the finishing stage of treatment. At that time some teeth may need to be over-rotated for stability (using rotation wedges) and first molars may need archwire offsets to complete their rotation.

One important in-out feature that has been added to the MBT Versatile+ appliance is because upper second bicuspids are frequently smaller in size than upper first bicuspids. For this reason, an upper second bicuspид bracket has been provided with an additional 0.5mm of in-out compensation. This will allow for better alignment of central fossae in the upper arch and also provide for relatively increased mesio-buccal rotation of the upper first molar. When upper second bicuspids are similar in size to the upper first bicuspids, an upper first bicuspidad bracket can be used on the upper second bicuspids.

- Figure 20 A patient in need of posterior buccal crown torque.

**MBT Appliance Versatility**

- Inversion of upper lateral incisor brackets (Fig. 23, 24, 25). This is beneficial in cases with palatally displaced laterals requiring labial root torque for proper stability.

- Inversion of cuspid brackets with prominent cuspid roots. (Figure 26, 27). This adjustment allows for movement of the cuspid roots away from the cortical plate and into the center of the alveolar process.

- 0° cuspid brackets with hook for extraction cases. (Figure 28). Many orthodontists prefer to have a hook on their cuspid bracket, and the zero degree torque value also allows the cuspid to move away from the cortical plate for easier retraction.

- Inversion of upper cuspid brackets when cusps are in the lateral position. (Figure 29, 30, 31). This adjustment allows the cuspid root to move palatally and assume a position and appearance that more closely resembles the lateral incisor.

- Same tip and torque in upper bicuspid brackets. Thus, in most situations, one bracket is used for all four upper bicuspids. This simplifies inventory and provides for less confusion during placement.

- Inversion of upper second bicuspid brackets. (Figure 32). Approximately 30% of upper second bicuspids are smaller than upper first bicuspids. This bracket is most beneficial in this situation. If all four bicuspids are the same size, then first bicuspid brackets can be placed on both first and second bicuspids.

- Same tip and torque in upper second bicuspid brackets. (Figure 33). This adjust-

- Lower second molar bands and brackets on lower first molars. When the buccal cusps of upper first molars impinge on the bracket of the lower first molar, the use of the lower second molar band with a much lower occlusal profile bracket often eliminates this problem.

- Lower second molar brackets on upper first and second molars when finishing in a Class II molar relationship. (Figure 34, 35). The lower second molar bracket has zero rotation and 10° of torque which places the Class II upper first molar in a correct relationship with the lower first molar.

- Inventory identification. This is vastly simplified by the pre-labeled individual blister packs of the APC™ Adhesive Coated brackets used in the operatory.
3. Bracket Placement

Prior to the development of the pre-adjusted appliance, edgewise brackets were placed using gauges which set the bracket a specific number of millimeters from the incisal or occlusal tooth surface. When the pre-adjusted appliance was developed, the center of the clinical crown became the vertical reference for bracket placement, and most orthodontists discontinued the use of gauges. The brackets were therefore placed by visually selecting the center of the clinical crown. Unfortunately, this method resulted in significant errors relative to vertical placement. For example:

- Gingival variations, such as partially erupted teeth, labially and lingually (palatally) displaced roots, and gingival inflammation led to placement errors.
- Large teeth (upper central incisors) and small teeth (upper lateral incisors) within the same patient led to obvious errors when brackets were placed in the center of the clinical crown.
- Incisal or occlusal fractures and wear, as well as teeth with extremely tapered and pointed cusps, led to bracket placement errors. (Figure 36)

The use of a bracket placement chart (developed in 1994), as well as pre-adjusted Dougherty gauges, Figures 37 and 38, dramatically reduces bracket placement errors in the vertical dimension. Figures 39 through 44 show placement technique. We have experienced approximately a 50% - 60% reduction in the need to reposition brackets during treatment using this very simple but effective system. Figure 39, 40, and 41 illustrate measuring on the occlusal plane, burnishing the band, and then light curing the band and tube in position. Figure 42, 43 and 44 show checking bracket height and tip, then curling.

In Figure 16 the MBT™ Versatile+ Appliance provides increased palatal root torque for the upper incisors (a, b) and increased labial root torque for the lower incisors (c), the most common requirements in orthodontic cases.

Upper Cuspid, Bicuspid and Molar Torque

Table 5 shows upper cuspid, bicuspid and molar torque values: Andrews’ non-orthodontic normal study, two Japanese studies, the MBT Versatile+ Appliance, the Original Straight-Wire Appliance and the Roth Appliance.

There are three reasons for reducing the amount of lingual crown torque in the lower cuspid, bicuspid and molar areas: 1) Since lower cuspsids and bicuspids often show gingival recession, they benefit from the roots being moved closer to the center of the alveolar process; 2) Many orthodontic cases demonstrate narrowing in the maxillary arch with lower posterior segments that are compensated toward the lingual. These cases benefit from buccal uprighting of the lower posterior segment. 3) It has been consistently observed that lower second molars with -35° of torque consistently “roll in” lingually. Therefore, the authors have chosen to reduce the lingual crown torque, by 5° in the lower cuspid and bicuspids, by 10° in the lower first molars, and by 25° in the lower second molars (Fig. 18a, b and 19a, b, c).
Upper Posterior Tip

Table 2 shows posterior tip measurements for the upper buccipris and molars: Andrews' non-orthodontic normal study, two Japanese studies, the MBT Versatile+ Appliance, the Original Straight-Wire Appliance, and the Roth Appliance.

<table>
<thead>
<tr>
<th>Upper Posterior Tip</th>
<th>Andrews' norms</th>
<th>Original SWA</th>
<th>MBT Versatile+</th>
<th>Original SWA *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi Bi Molar Molar</td>
<td>6.3° 6.3°</td>
<td>3.3° 3.3°</td>
<td>0° 0°</td>
<td>0° 0°</td>
</tr>
<tr>
<td>2nd Molar Bi Molar</td>
<td>4.7° 4.7°</td>
<td>3.9° 3.9°</td>
<td>0° 0°</td>
<td>0° 0°</td>
</tr>
<tr>
<td>1st Molar Bi Molar</td>
<td>4.7° 4.7°</td>
<td>3.9° 3.9°</td>
<td>0° 0°</td>
<td>0° 0°</td>
</tr>
<tr>
<td>1st Molar 2nd Molar</td>
<td>5.0° 5.0°</td>
<td>4.3° 4.3°</td>
<td>0° 0°</td>
<td>0° 0°</td>
</tr>
</tbody>
</table>

For the MBT Versatile+ Appliance, 0° tip, as opposed to 2° tip, was selected for all upper buccipris brackets to place the crowns in a slightly more upright position, (in Class 1 direction). It also provides for slightly reduced anchorage needs for the upper arch.

The buccal groove is the reference for crown tip in the upper molars. This buccal groove shows a 5° angulation to a line drawn perpendicular to the occlusal plane. There are two methods of achieving 5° of effective tip in the upper first and second molars.

If a 5° bracket is used, the band must be seated more gingivally at the mesial aspect to position bracket wings parallel to buccal groove. (Fig 14a). This makes band positioning more difficult. When using these 5° brackets, it is frequently necessary to trim band material from the distal end of the band. If the 5° bracket is used and the band is placed parallel to the occlusal plane, it provides an excessive 10° of actual tip to the upper first and second molars. (Fig 14b).

The authors prefer to maintain 2° of mesial crown tip in the lower buccipris. Angling these teeth slightly forward in this manner moves them more in a Class I direction; 2° of tip is also preferred in the lower first and second molars. This is accomplished in a manner similar to the tip placed in the upper molars.

The lower buccal groove lies 2° off of a line drawn perpendicular to the occlusal plane. As with the upper molars, introducing this 2° of tip to the lower molars can be accomplished by placing 0° tip brackets parallel to the occlusal plane. In summary then, the lower buccipris brackets show 2° of mesial crown tip and the lower molar brackets show 0° of crown tip (2° effective tip) with the bands placed parallel to the occlusal surface.

Incisor Torque

Table 4 shows anterior torque values: Andrews' non-orthodontic normal study, the MBT Versatile+ Appliance, the Original Straight-Wire Appliance and the Roth Appliance.

The authors observed that torque is rather poorly controlled with the pre-adjusted appliance system. This is due to the fact that the forward movement of the incisors is a difficult one since less than 1mm of contact between the bracket and the wire must be maintained during movement. In general, here lies the greatest challenge to bracket design in the pre-adjusted appliance. In the majority of orthodontic cases, because of this lack of torque control, torque tends to be lost in the upper incisors during overjet reduction and space closure. The lower incisors frequently tend to procline forward during Curve of Spee leveling and when eliminating lower incisor crowding. This incisor torque factor, along with the tip and tooth size factors, frequently prevents posterior teeth from fitting into a Class I relationship.
choices for inter-molar width. Therefore, this area can be easily widened or narrowed for each patient, particularly in the rectangular wire stage of treatment and in the heavier wires just prior to this wire. This of course is much easier to do than constantly adjusting to the anterior aspect of the arch form, which is much more difficult and very time consuming.

Editor: What other methods can be used to aid in the stability of the orthodontic case relative to arch form?

Dr. McLaughlin: Rather than proceeding from rectangular wires to retainers, it is beneficial to allow cases to settle for a minimum of a month and a half in very light wires at the end of treatment. This allows for settling of the arch form to a more physiologic position for the patient, based on the tongue and face musculature. It also allows for vertical settling of the dentition, which is most important. In addition to this, the use of a bonded lower anterior retainer allows for some settling of inter-cuspid width without movement in the incisor area.

Editor: You have recently developed a more efficient system of archwire sequencing by taking advantage of major developments in wire technology. Was this sequence transition easy, and more important, how valuable has it been in your practice?

Dr. McLaughlin: Figures 46 and 47 illustrate the six wires replaced by only two wires for the .022 slot MBT® Versatile+ Appliance system.

Fig. 47 Nitinol Heat-Activated .019 x .025” replacing .016”, .018” and .020” round stainless steel.

The use of the .016” Nitinol Heat-Activated wire to replace multi-strand wire and the .024” round wire has been most satisfactory. This initial arch wire can be placed with ease in most cases, and can be retired one or two times at 4 to 6 week intervals.

Nitinol Heat-Activated .019 x .025”

Fig. 48

The .019 x .025” Nitinol Heat-Activated can also be retired at the same 4 to 6 week intervals.

Nitinol Heat-Activated .016” replacing .015” and .0175” multi-strand steel and .014” stainless steel.

Fig. 46

As Figure 48, 49, 50, 51 illustrate, engagement of a Nitinol Heat-Activated wire can be facilitated with use of Endo Ice®, followed by tying in with a steel ligature®. Because of rapid cooling, this procedure can be performed quickly and comfortably. (*CF: Newswire article by Dr. Joseph Caruso, Spring 1994)

The remaining wire used is a .019 x .025” rectangular stainless steel. Use of Nitinol Heat-Activated wires in my orthodontic practice has resulted in much less chair time involved in each visit. Secondly, the intervals between patient visits has been slightly increased. Thirdly, tooth movement is actually much more efficient, and as a result, the aligning phase of treatment is completed more rapidly. This in turn allows me to complete overbite control, overjet reduction and space closure sooner in treatment, which in turn allows more time for finishing and detailing of the case, which enhances treatment end result quality.

Table 1 Anterior Tip

<table>
<thead>
<tr>
<th>MBT</th>
<th>Andrews</th>
<th>Watanabe’s data</th>
<th>Original SWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roth 2.4mm</td>
<td>13°</td>
<td>9°</td>
<td>5°</td>
</tr>
<tr>
<td>Andrews 1.7mm</td>
<td>11°</td>
<td>9°</td>
<td>5°</td>
</tr>
<tr>
<td>Roth 2.4mm</td>
<td>13°</td>
<td>9°</td>
<td>5°</td>
</tr>
</tbody>
</table>

Fig. 10, 11. If the original research figures, there is no compromise in ideal functional occlusion as described by Roth. However, it has been observed by the authors that with light continuous force mechanics, tip is well controlled by the pre-adjusted appliance. Using “lace-backs” and “bendbacks” during leveling and aligning, and elastic module “tie-backs” during space closure, very little adverse tipping occurs during these stages of treatment. By the finishing stage of treatment, completely leveled upper and lower rectangular wires are normally in place, indicating that full expression of both anterior and posterior crown tip has occurred. Thus, additional tip is not seen to be necessary in the anterior segments.

Nitinol Heat-Activated .019 x .025”

Table 1 shows anterior tip measurements: Andrews’ non-orthodontic normal study1; two Japanese studies2, 3; the MBT Versatile+ Appliance, the Original Straight-Wire Appliance* and the Roth Appliance®.

The anterior tip measurements for the original Straight-Wire Appliance are all greater than those found in Andrews’ research. This was presumably due to what Andrews referred to as the “wagon wheel” effect* that torque places on anterior crown tip. This is somewhat similar to the compensating anti-tip, anti-rotation and power arms built into the extraction brackets for the treatment of bicuspid extraction cases.

*As palatal root torque is added to the anterior segment, mesial crown tip is reduced

Fig. 51

Also, additional anterior tip creates a significant drain on molar anchorage, Figure 10, 11. If the original research values for tip are used, a total of 10° less distal root tip in the upper anterior segment and 12° less distal root tip in the lower anterior segment is needed (compared against the Original Straight-Wire Appliance). So Figures 10 and 11 show the difference in root positions with MBT Versatile+ Appliance and two SWA.

Table 2 Anterior Tip

<table>
<thead>
<tr>
<th>MBT</th>
<th>Andrews</th>
<th>Watanabe’s data</th>
<th>Original SWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roth 2.4mm</td>
<td>0.0°</td>
<td>10.0°</td>
<td>21°</td>
</tr>
<tr>
<td>Roth SWA</td>
<td>0.0°</td>
<td>10.0°</td>
<td>21°</td>
</tr>
</tbody>
</table>

Fig. 12

It has been observed by the authors that with light continuous force mechanics, tip is well controlled by the pre-adjusted appliance. Using “lace-backs” and “bendbacks” during leveling and aligning, and elastic module “tie-backs” during space closure, very little adverse tipping occurs during these stages of treatment. By the finishing stage of treatment, completely leveled upper and lower rectangular wires are normally in place, indicating that full expression of both anterior and posterior crown tip has occurred. Thus, additional tip is not seen to be necessary in the anterior segments.

Also, additional anterior tip creates a significant drain on molar anchorage, Figure 10, 11. If the original research values for tip are used, a total of 10° less distal root tip in the upper anterior segment and 12° less distal root tip in the lower anterior segment is needed (compared against the Original Straight-Wire Appliance).

Fig. 13 This X-ray shows a case treated with a bracket with excessive cuspid tip. This is what the MBT Versatile+ bracket was designed against. Thus reduced tip significantly reduces the need for anchorage control, which normally translates into a reduced need for patient cooperation. Since the MBT Versatile+ measurements are identical to Andrews’ original research figures, there is no compromise in ideal static occlusion. And if the condyles are in centric relation, there is no compromise in ideal functional occlusion as described by Roth.
Finishing
Finishing involves three main processes:

- The correction of mistakes made earlier in treatment (bracket positioning, torque control, anchorage control etc.)
- Over-correction as needed (periodontal, alveolar-sutural, muscular, and growth)
- Setting of cases in light wires for approximately six weeks (minimum) prior to debanding

Retention
Retention is accomplished using a combination of bonded retainers for the lower anterior segment, wrap around retainers, and some positioners as upper retainers to allow for continued lower anterior segment, wrap around combination of bonded retainers for the upper teeth, aesthetic brackets for an aesthetic appearance during treatment.

2. MBT Appliance Bracket System
Victory Series™ Brackets – Figures 1, 2, 3 show a good candidate for this small steel bracket, as evidenced by the patient's short clinical crowns.

Clarity™ Brackets – Figures 4, 5, 6 show Clarity metal-reinforced ceramic brackets on her upper teeth, aesthetic brackets for an aesthetic appearance during treatment.

Full Size Twin Brackets – Figures 7, 8, 9 show a patient with large teeth, a difficult malocclusion and poor hygiene. The larger bracket will maximize base surface area and increase control.

Editor: What role do the tapered, ovoid and square wire arch forms play in preventing relapse?

Dr. McLaughlin: With the edgewise appliance, most orthodontists customize archwires to the patient's arch form. When the pre-adjusted appliance was developed, there seemed to be an unwritten assumption that one specific arch form needed to be used for that system, and that arch form was the most appropriate.

After twenty years of using the pre-adjusted appliance, it is apparent that customizing the arch form to the individual patient is what is really most important. Failure to do this will result in relapse. In and out dimension covered some problems, but not all of them. What I would like to see is a return to a customized arch form for each patient without the need to overstock office inventory or waste time in unneeded wire bending. This seems to be the best method of efficiently achieving stable and aesthetic end results.

REFERENCES


This seminar presents a discussion of the McLaughlin, Bennett, Trevisi (MBT) philosophy of orthodontic treatment. State of the art mechanics using light continuous force systems are described in detail. The newly developed MBT Versatile+ Appliance, designed specifically to coincide with and enhance the treatment mechanics, is also presented. The six stages of orthodontic treatment are reviewed using the sequential demonstration of a variety of case reports. This is a practical and very clinically oriented program, which will give you information that is immediately useful for the modern orthodontic practice.

Inter-Arch Treatment Mechanics - Available in 1998

This seminar is a natural progression of the "New Concepts" seminar. The principles of intra-arch treatment mechanics are carried over and applied to the management of cases requiring attention in the area of inter-arch management. It is the efficient management of intra-arch factors that allows the orthodontist to focus on the challenging aspects of inter-arch management. Considerations include the far more difficult challenge of placing the upper and lower dentitions in three planes of space within the facial complex so that they are esthetic, fit properly during static occlusion, allow the condyles to be seated into a centric relation position within the glenoid fossae in a step by step manner, with the correct condyle position.

Considerations include the far more difficult challenge of placing the upper and lower dentitions in three planes of space within the facial complex so that they are esthetic, fit properly during static occlusion, allow the condyles to be seated into a centric relation position within the glenoid fossae in this static position, and function from this static position without interference during lateral and protrusive movements. Thus, inter-arch considerations include such factors as growth and development, and the management of vertical, horizontal and transverse skeletal and dental discrepancies. The subjects of Class II, Class III and Asymmetrical treatment areas are also discussed.

Management of the Dentition - Available in 1999

This seminar describes the management and correction of specific dental problems involving each individual tooth. Thus, specific clinical situations related to incisors, cuspsids, 1st and 2nd bicuspids, and 1st, 2nd and 3rd molars are discussed. The extraction versus non-extraction issue is reviewed in detail. The seminar will also provide an in-depth review of the material in Dr. Bennett's and Dr. McLaughlin's newest textbook, Orthodontic Management of the Dentition with the Preadjusted Appliance.

Occulsion and the TMJ in Orthodontic Treatment

Correction of malocclusion to a position in which the condyles are in the correct position can be likened to the proper construction of a house's foundation. Without it, the house is subject to future instability, as is the malocclusion treated to the incorrect condyle position.

This seminar presents a comprehensive review of the management of orthodontic patients with Temporomandibular Disorders. The concept of ideal occlusion is discussed as well as its relationship to temporomandibular disorders. The subjects of diagnosis and treatment planning, splint therapy, and post splint management with orthodontic appliances is discussed in detail.

Diagnosis, Treatment Planning and Treatment Mechanics

This seminar brings together the information from the previous four seminars by placing emphasis on the all important area of diagnosis and treatment planning. The topics covered in previous programs are all relevant to this seminar, which looks at a wide variety of treatment situations. Each case is evaluated from a diagnostic point of view, and participants are invited to make their own judgments concerning treatment planning. The treatment which was completed is then reviewed in a step by step manner, with the results being evaluated. Class I, II and III and Asymmetrical treatment options are reviewed as well.