Treating TMJ in the Orthodontic Office

Part II – Diagnosis

In the first part of this article, I discussed the rationale for treating TMJ patients in the orthodontic office. The facial patterns that we deal with on a daily basis in our orthodontic practices have potential effects on the TM joints and surrounding musculature. A set of mechanical principles was also presented which, when utilized properly, can assist in assuring consistently-predictable treatment results. By treatment results, I am referring to both splint therapy and any subsequent occlusal alterations. The process of treating these patients begins with the diagnosis, which is the key to developing a successful treatment strategy — it will make or break you. If the diagnosis is accurate, treatment is most often successful and stable. If it is hazy or inaccurate, treatment time can be, at best, prolonged and, at worst, a failure.

The diagnostic process should begin when the patient first calls the office (Figure 1). Besides the usual clerical information, this is an ideal time to begin gathering the data that will assist the development of a diagnosis. The patient can be briefly asked about any previous treatments undergone for the problem, who provided the treatment and the degree of success that was obtained. It is very important that the patient be instructed to bring along any related medical records that they may have, along with any splints that they were given. From this, you can determine what does not work for this patient. The attitude of the patient toward treatment should also be noted, which will later aid in estimating a prognosis, treatment time and fee. Some patients are extremely talkative, which should be noted, since appointment times will need to be adjusted to accommodate them.

Scheduling TMJ Patients

While I am discussing the prospect of adjusting appointment times, it would be appropriate to discuss the scheduling of TMJ patients in general. One of the biggest mistakes many orthodontic practices make is to schedule TMJ patients the same way their orthodontic patients are scheduled. This is a serious error! The typical TMJ patient is in pain, and although it may be chronic pain of long standing, when they call your office they want to be seen quickly. Forcing these patients to wait many weeks for an examination, as we often do in orthodontic practices, creates a negative beginning to the patient experience, besides being just plain inconsiderate.

It is easy to set up your schedule to allow for a set number of TMD new-patient appointments each month. This can be determined from the average number of new TMD patients seen in the previous three months. If you see an average of 10 TMD patients a month, you should hold open between two and three TMJ slots each week. If a particular slot is not filled, it can be released for general scheduling three or four days prior to the reserved date. This assures that appointment times will be available for patients in pain.

Routine appointments for TMJ patients must also be handled differently from orthodontic patient appointments. Since these patients must be seen on a weekly basis, it is important to allow ample time for discussion and adjustment of splints and other appliances. The patient’s condition should be carefully monitored and necessary adjustments made on a regular basis.

by Randall C. Moles, D.D.S., M.S.
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or biweekly basis, major difficulties are created in the orthodontic office where patients are seen on a four- to six-week rotation. This can be remedied by always scheduling three appointments in advance. For example, a patient who is in the office today for a splint adjustment would have two more appointments previously scheduled and would receive another appointment one or two weeks after the last. This brings the scheduling of that patient's appointment out far enough to allow for easier scheduling. Of course, as with orthodontics, time must be allowed in the schedule for emergency visits.

Interview and Examination
Upon arriving at the office, new TMJ patients are greeted warmly and asked if they brought the health history and pain chart that was mailed to them after their initial call to the office. The greeting staff member observes and notes any poor posture or unusual gait. After a brief tour of the office, a staff member interviews the patient in a private consultation room. The patient's chief complaint and when their problems first began are noted. Previous evaluations and treatments by physicians, dentists and other health professionals are discussed in detail along with any relief that was obtained. This can give you an idea of what won't work. Be on the lookout, however, for treatments that were incomplete. It is not uncommon to find a patient who has had splint therapy and was instructed to wear the splint only at night or who had splint therapy without any physical therapy. They may have been left with a very poor occlusion. It may only be necessary to provide a more complete and comprehensive treatment to resolve the problem.

These patients often suffer from more than one type of headache and each should be documented relative to the type, location, frequency and duration of the pain. For example, a patient may complain of daily "stress" headaches located in the back of the head – a mild, dull ache that occurs in the afternoon, usually on work days. The patient may also suffer from "sinus" headaches which occur once or twice a week – strong aching located around the eyes. Last of all, they may suffer from "migraines" that occur every few months, affect their entire head and are so severe that they are forced to miss work. All of these headaches may be a continuation of the same problem, possibly TMJ. This can be confirmed in the examination.

The type of headache can be misleading, since many of these patients have previously been misdiagnosed. What was diagnosed as migraine is often referred pain from trigger points in the masseters. What was diagnosed as sinus headaches is often referred pain from trigger points in the lateral pterygoid muscles. However, the patient's description of the type of headache is useful since it defines the new patient's problem and will be useful in evaluating future progress in their own terms.

The location of the pain is a critical factor in the diagnostic evaluation. Interviewing the patient as to the exact location of the pain is extremely important, for it can be correlated with the exam findings, especially trigger points. For example, if a patient's pain is located directly above the eyes, you would look for trigger points in the sternocleidomastoid. If the pain is located directly below the eyes in the area of the maxillary sinuses, you would look for trigger points in the lateral

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The frequency of the pain includes not only how often but also when it occurs. Both these factors are very important, for they can give you an idea of possible causative factors. For example, headaches that are present upon waking point to possible bruxing and occlusal problems. Headaches occurring later in the morning can be caused by low blood sugar if breakfast has not been eaten or by irritation of inflamed joints and muscles from speaking and chewing. Headaches occurring in the afternoon can be related to eye strain, irritation of already inflamed joints and muscles, or neck strain. Later in the day, neck strain often becomes a more significant factor. When you examine the patient, you can then look for confirmation of these possible causes.

The duration of the pain is often an indication of the severity of the problem and its resistance to treatment. You need to be especially concerned with pain of recent onset (a few months or less). Recent pain increases the possibility of a more serious medical problem. Therefore, be sure of your diagnosis or refer for medical evaluation. Long-standing pain reduces the chances that a life-threatening problem exists, although it does indicate that the treatment may take longer.

After you have determined the nature of the pain, you need to ask the most important diagnostic question, “Is there anything that makes the pain better or worse?” The answer will often reveal the cause of the problem and its treatment. If the patient indicates that the pain is aggravated by chewing, there is a high probability that it is a joint or muscle problem and will respond positively to a splint and physical therapy. Often the patient will say that the pain is relieved by moist heat, which indicates a muscle problem that would most likely respond well to heat and physical therapy. If they tell you that regular pain relievers don’t help, it is a sign that muscle pain is involved, since muscle pain is often resistant to pain medications. If they say that the pain increases while they are at work, you will need to question them about work habits which might create strain in the paracervical muscles. These neck problems tend to respond favorably to splint therapy because the splint will create a more upright head posture while relaxing the anterior cervical muscles. Many TMJ patients are under stress. Often, the stress comes from the pain itself and its negative effects on the patient’s life. It is always important to ask questions about the level of stress the patient is experiencing. You can even give one of the various tests used to determine the stress level and even the source. If the patient indicates that they are under a lot of stress, referral for “stress counseling” may be appropriate. Also, don’t forget to ask the patient about how they are sleeping. A history of waking up at night and being tired in the morning may point to fibromyalgia, which is a general inflammation of the muscles and is associated with disturbed sleep patterns.

A thorough interview by a staff person will usually take between 10 to 20 minutes. This depends upon the skill of the interviewer and the talkativeness of the patient (which should have already been determined at the initial phone call and scheduled accordingly). When the staff member has completed her interview of the patient, it will usually take only a few minutes to repeat her findings to you and for you to ask clarifying questions. With this approach, an extensive and sometimes rambling interview need not occupy the doctor’s time, allowing him to get right to the point. The patient can now be invited to the examination room where you can begin an informed examination using a systems approach (Figure 2).

**Examination**

The main focus of the examination is to begin the process of confirming what was unveiled in the interview process. If your interview was thorough, the probability is high that you will already have a very good idea of what the patient’s problem is and how you are going to proceed with treatment. By using a systems approach, you can correlate what they have been saying with what you find during your examination. For example, if the patient complains of chronic “sinus” headaches with pain below the eye, you would expect to find some sensitivity in the lateral pterygoid muscle, since trigger points in this muscle will refer pain below the eye. You might also be looking for structural or occlusal disharmonies.
that would require the condyle on the affected side to be moved forward, since that would strain that lateral pterygoid muscle.

A systems approach is commonly used in medicine. It is nothing more than examining the patient in an orderly fashion according to functional systems. In a TMJ examination, you would start with an evaluation of the function of the joint itself, followed by the associated muscular, occlusal and skeletal system. The function of the cervical area could then be evaluated, along with the associated muscular system (many TMJ patients have concomitant cervical dysfunction) and the neurological condition of these areas could be evaluated, if indicated.

Joint function can be determined by evaluating all functional jaw movements as to maximum limits with and without pain. When the patient reaches maximum opening, can they open a little farther with gentle pressure on the front teeth ("soft-end feel")? This is usually diagnostic of a muscular problem. If their maximum opening is unyielding to pressure ("hard-end feel"), it indicates an internal joint problem (Figure 3). The smoothness and coordination with which movements are performed are also important. Small deviations back and forth reveal a lack of muscular coordination. Large deviations are more diagnostic of internal joint problems. Many times, a patient will be referred to the office with what appears to be an acute closed lock, even though they are able to make normal excursive movements. This is characteristic of a muscle spasm. The sounds generated by the moving joints are helpful in aiding in establishing a diagnosis, but for the most part, unless you are dealing with an early click or contemplating joint surgery, they often have little effect on the actual treatment plan.

The muscular system is examined for feel, texture and the ability of the muscles to perform under load. Muscles are palpated to determine if they are hypertrophied, which is indicative of parafunction. They are also palpated for general soreness or discrete trigger points, again pointing to dysfunction. Palpation should be directed toward determining if the trigger points are those that would tend to refer pain in the same pattern that the patient described during the interview (Figure 4). This is how you can confirm your diagnosis. It is important to note that the less your examination findings correlate with the patient's description of the pain, the more you need to be wary. This does not mean that you would not use a "diagnostic" splint – it means you should be more careful. You could still use a "diagnostic" splint, but be cautious with estimates of success or treatment time.

Since many TMJ patients also have cervical dysfunction, it is imperative that the examination include an evaluation of cervical mobility along with palpation of the cervical musculature. Forward and backward flexion, along with rotation, are evaluated in the same manner as the TMJs. The head can be rotated 45° and tilted to the same side while pressure is being applied to the top to test for nerve entrapment exiting the spinal foramina. Again, correlation of findings with the patient's pain pattern is important. Splints can have a significant effect, either positive or negative, on cervical dysfunction, because a splint will change head posture. If an increase in cervical

continued on page 23
movement of any tooth in any direction with the proper application of pressure has long been a tenet or principle of Bioprogressive Therapy. Some clinicians have steadfastly maintained that it is impossible to move upper molars distally more than 1 or 2mm. Contrary to this opinion, newer, more predictable methods of force application to the upper molars have proven that in many cases the ability to move the upper molars distally is virtually unlimited. Whether that is always desirable is another question, but the mechanical applications to do so are no longer in doubt. It is the purpose of this article to further explore one of these distalizing techniques and to discuss the sequelae of its use. The Pendulum or Pendex Appliance that was described in the first part of this article was designed by Dr. James Hilgers to use the inherent anchorage provided by the palate and, to some extent, the upper buccal segment teeth, to distalize, expand and rotate the upper molars without unduly disturbing the lower arch.

It became very clear at the outset that moving the upper molars back was not the difficult part of this form of appliance therapy - it was, in fact, very dynamic and predictable. Holding them back during retraction of the rest of the maxillary teeth has been a more challenging task, however. It makes absolutely no sense to simply round-trip the molars with little or no Class II correction. The techniques described herein define the authors’ experience with molar stabilization to date.

There are basically 13 techniques that can be used singly or in concert to position the upper molar in its proper location. Each will be discussed and demonstrated separately. They are:

In Part I of this two-part article, Drs. Hilgers and Bennett described fabrication, activation and placement of the Pendulum Appliance. In Part II, “Maintaining the Gain,” they discuss the current philosophy and technique involved in stabilizing and maintaining the newly achieved molar positions. They will focus on the short-term responses (12 weeks) observed and evaluated in 13 serially treated noncompliance cases and the final results on two “pendulum only” cases.
1. Overcorrection
2. Quick-Nance (Hilgers)
3. Short-term headgear
4. Stops on archwires
5. Upper utility arch
6. Push coil spring at cuspids
7. Early bonding in the upper arch
8. Class II elastics
9. Upper lip bumper
10. Hawley- or clear-type retainers
11. Bionator
12. Short-haul Herbst appliance
13. Long-haul Herbst appliance

1. Overcorrection (Figs. 1-2)

Indications for Use:
Commonly indicated as the sole method of correction where the Class II malocclusion is very mild. If the upper molar can be moved distally and tipped back early in the eruption sequence of the upper teeth, the erupting bicuspids will have a tendency to drift distally, also. Although much of this overcorrection comes by virtue of upper molar tipping, in the strong growth patterns the inclined-plane effect uprights these teeth with little or no mechanical intervention. In more severe Class II malocclusions, the molars are greatly overcorrected and used in conjunction with other anchorage techniques mentioned herein. It is axiomatic that the farther you need to go, the more you need to overcorrect. Simply put, just moving the upper molar back into a Class I occlusion is most often not enough. Moving it back into a Class III relationship is more desirable.

Technique: The more the upper molar moves distally in a Class II malocclusion, the more it must be expanded to prevent crossbite. The midpalatal jackscrew is activated one turn every third day to create this expansion in the molar region. As the molar is tipped distally, it has a continued on following page

Part II:

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tendency to rotate mesially - a phenomenon quite commonly seen when using reverse curve Ni-Ti archwires. This is thought to be due to the nature of the cortical bone surrounding these teeth, but other mechanical factors no doubt come into play. This can be compensated for somewhat by placing approximately 30 degrees of distal rotation in the terminal legs of the Pendulum springs.

**Considerations:** Since the distal movement of the upper molars occurs so rapidly (10-12 weeks), there is a transient bite opening due to driving these teeth back into the wedge of occlusion. This is commonly not a problem with brachyfacial types, as muscular rebound and growth more than compensate for this initial bite opening. In fact, in extremely strong muscular patterns, this response can be very beneficial in the bite opening process. But in vertical growth patterns with weak muscular rebound, bite opening can be a harbinger of further negative side effects. Once the bite opens, the tongue goes into the interspace, sometimes initiating a reverse swallow/tongue thrust (if it doesn’t already exist). Severely tipping the upper molar only aggravates this problem because the bite can be propped open on the inclines of these teeth, allowing the buccal segments to supererupt. The answer: choose this type of appliance only in mesofacial and brachyfacial types where the muscular pattern, growth and subsequent mechanics can compensate for this response. Fortunately, approximately 65% of all Class II malocclusions fall into this category. In the others, a more conservative approach should be utilized.

2. **Quick-Nance** (Figs. 3-10)

**Indications for Use:** The Quick- or Insta-Nance appliance is utilized commonly to stabilize the molars in their overcorrected locations. The advantages are numerous. Compliance is not needed as the palatal vault is still utilized for...
Technique: A series of preformed Nance cribs (available soon from Ormco) fabricated from .032 stainless steel is used to make the Quick-Nance. The authors take an impression of the upper arch at the appointment prior to Pendulum removal. This allows for preselection of the proper Nance crib (there are 5 sizes). The .032 wire size is utilized because it is easily placed recurved to fit into the .036 lingual sheath. Although the wire fits quite loosely into the sheath, it is stable enough once the acrylic button has been formed. After the pendulum appliance has been removed, the patient is instructed to brush the roof of the mouth. The crib is then fitted into the lingual sheaths. Since the upper molars have been tipped back a bit, the anterior portion of the crib should be somewhat away from the palatal rugae. This is desirable at this point as you need to bend the crib down into the soft acrylic so that there is no void under the button after fabrication. The roof of the mouth is thoroughly dried with an air syringe so that the soft acrylic button doesn’t flow prematurely. A ball of Triad light-set acrylic approximately 1 cm in diameter is formed and placed up against the rugae at the greatest depth of palatal vault, and the Nance crib is bent into the acrylic ball, using a three-pronged pliers (just mesial to the molar lingual sheaths). The button is then smoothed and contoured around the retention loop of the Nance crib, making sure that there are no voids and that all the edges have been rounded for comfort. This is best accomplished with the Teflon blade that accompanies the Triad acrylic and can be further smoothed with a moistened finger. A Kulzer light is then used to set the acrylic button. The patient is informed that the acrylic might become slightly warm and to raise their hand if it becomes uncomfortable. The acrylic is set in four 20-sec. bursts of light (1 min., 20 sec. overall), giving a few seconds between each burst to allow for cooling of the acrylic as necessary. The patient is then instructed on the cleansing and care of the newly placed Quick-Nance appliance.

Considerations: Although the Quick-Nance is the appliance of choice in many Pendulum cases, there are certainly contraindications and precautions. The Nance button cannot be placed over already inflamed or compressed tissue. When the palatal tissue is inflamed, the use of a clear immediate (Tru-Tain type) retainer for approximately one week will allow for adequate recovery of the tissue. This retainer must be placed immediately to prevent the almost instantaneous rebound. It is also not judicious to place immediate and heavy retracting forces against the Nance button, as you will surely bury the button in the tissue. Normally, the buccal segments are allowed to drift distally for six to ten weeks before any retractive force is placed upon them. If the buccal segments can be “floated” distally (not sliding along an arch wire), this will further reduce the pressure on the Nance button. It is quite common to use an upper utility arch and an elastomeric chain to free-floating the buccal teeth back into Class I positions. Patience is the key here. Quite often, when the Pendulum Appliance has been used in Phase I and the permanent buccal teeth have yet to erupt, the Quick-Nance will serve as the only anchorage unit. The upper buccal teeth will drift distally as they erupt, further simplifying the overall mechanics.

3. Short-term headgear (Fig. 11)

Indications for Use: Sometimes we forget that there are some cooperative patients out there. In those cases where the patient acquiesces to wear the headgear, they are told that it will be for a few months only. It is the best of both worlds. The molars are already in an overcorrected Class I relationship, so the headgear is used for anchorage while the upper buccal segments are being retracted. This is usually no more than a three- to four-month period.

Technique: Most often, a high-pull headgear is selected because its direction of force allows for molar uprighting on the already distally tipped molars. The outer bow is kept high, above the center of resistance of the tooth, and moderate-force loads applied (500-750 grams). The headgear can be used in conjunction with other anchorage methods so that if compliance wanes, the molars will not be allowed to rebound.

Considerations: As with any headgear, if you are unsure about the ability of the patient to comply, it can be a somewhat questionable technique. We try to choose only those patients whose background and responsibility levels appear to be good. A cervical headgear should be used for the overcorrection of Class I relationship. A short-term (3-5 months) high-pull headgear worn while retracting buccal segments. Outer bow is high to help distally upright molar roots. You must be sure of patient compliance.

continued on page 14
he lower incisors are the basis for orthodontic diagnosis and, ultimately, their retention is the key to preventing relapse. The relapse can be in the form of crowding, increased overbite and overjet, deepening of the Curve of Spee and accentuations of the Curve of Wilson. Lower incisor stability is crucial to maintaining a healthy, esthetic and functional denture.

Every treated orthodontic patient has relapse, some more than others. Studies indicate approximately 50 percent of the relapses are severe enough to be unacceptable. The difficulty lies in determining which patients are going to wind up in the unacceptable 50 percent.

Treatment by extracting teeth or not extracting teeth makes no difference in stability of the treated result. Therefore, with no accurate method of determining which half of your treated patients is going to relapse to an unacceptable degree, it may be prudent to retain all treated patients permanently.

Permanent retention has evolved for several reasons. Some of them are:
1. We now have a means of adhering wire to the enamel on the lingual surfaces of teeth.
2. We are aware that permanent retention is now possible.
3. It’s a simple procedure to do.
4. We feel a professional obligation to assure a permanent correction.
5. We have concerns regarding a more litigious society.
6. Many of us have re-treated our previously-treated relapsed patients.
7. Regardless of diagnosis, treatment plan and excellence of treatment result, the high percentage of relapse cases is unacceptable.

The method presented here for placing a permanent retainer is not the only one but it is a successful one. The steps are:
1. The finished result should have a normal overbite and overjet.
2. Align upper and lower incisors so the contact points are correct.
3. Flatten the lingual surfaces of both cuspids with a high-speed diamond wheel so the pads lay as flat as possible. Remove irregularities from the lingual of the four incisors that prevent the wire between the pads from making contact with the mesial and distal of each lower incisor.
4. Adapt an Ormco preformed three-to-three so the pads fit as low as possible on the lingual surfaces of the cuspids and the wire between the pads rests high on the lingual of the four incisors but yet is not visible.
5. Adhere the lingual in place with light-cured adhesive (30 seconds).
6. Cover the lingual pads and surrounding enamel of the by Les O. Starnes, D.D.S., M.S.
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cuspids with Herculite (a dense enamel restorative material from Kerr).

7. Light cure for 40 seconds.

Augmenting the fixed three-to-three lower retainer with an upper vacuum-formed clear retainer worn only at night assures the patient of a simple retention procedure. Both can be worn indefinitely. The time required to place a lower three-to-three is 20 minutes of staff time and 10 minutes of doctor time. The upper clear retainer requires no more than 5 minutes of doctor time.

The three-to-three bondable lingual retainer currently has a lingual offset at each pad, apparently to accommodate a finished result that has the cuspids lingually positioned (Figure 1).

The lingual wire is also soldered to the gingival end of the pad which works against the need for occlusal placement of the wire and gingival placement of the pad (Figure 2).

The modifications I make to the three-to-three prior to placement are:

1. Remove the cusp offset bend. Anatomically, a properly finished treatment result should have the lingual surfaces of the six incisors form a perfect arc (Figure 3).

2. Make a bend mesial to each pad that gingivally positions the pads (or occlusally positions the wire) as much as possible (Figure 4). With these adjustments, I've found the Ormco bonded lingual retainer to be superior to others; it's easy to adapt and bond failure is almost nil.

3. Reduce the profile of the wire and solder joint on each pad by grinding.

Under normal circumstances, these retainers do not come off when properly prepared and placed. The rewards are numerous:

a. The lower incisors stay retained.
b. The lower incisors help retain the upper incisors.
c. Maintained incisor integrity helps prevent Class II relapse.
d. Patients' retention problems and visits are minimized.
e. The orthodontist's daily schedule is free of time-consuming and costly retention visits. Doctors interviewed estimated they spent a minimum of one hour per day of appointment time for retention visits. These retention visits can be eliminated and turned into productive income time.

Fixed lingual retainers BONDED TO ALL SIX lower anterior teeth should not be worn indefinitely. They tend to not be self-cleaning and are too difficult to clean by brushing and flossing. Excessive plaque accumulation with resulting tooth-supporting tissue loss makes their long-term use impractical.

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The three-to-three bonded only to the cuspids does not create an impractical cleaning problem. It also allows tooth movement during mastication which is necessary to maintain long-term dental health.

Having used this retention procedure for many years, I now have literally thousands of these retainers currently being worn with no complaints. Instead of a designated retention period, I now can offer lifetime retention at no charge except for the rare replacement cost.

In conclusion, this simple permanent retention method virtually guarantees a stable finished result with no maintenance cost to patient or doctor.

**Bondable 3-to-3 Lingual Retainers**

Bonded 3-to-3 Lingual Retainers, bonded only at the cuspids, provide the ideal answer for long-term retention. Unlike retainers bonded to all six lower anteriors, they accommodate brushing and flossing and are not nearly so subject to hygiene problems. The Bonded 3-to-3 Lingual Retainer is fabricated in an arch form with offsets to position cuspids lingually. The wire can be easily adapted to take out this offset for those who prefer a perfect lingual arc and to make any other adaptations desired. The retainer may be placed before or after appliance removal. A measuring template is provided to assist in size selection. Seven sizes provide an adequate assortment for rapid fitting of the retainer to the patient. The retainer may be fitted to a model or, in some cases, directly to the patient.

Bondable 3-to-3 Kits provide 21 appliances, distributed in the seven sizes according to popular usage. Individual components may be ordered separately. For order information, see Page D of the Center Section.
Is patient communication important to you? I bet it is. Do you try to explain orthodontics in ways that will enhance patient understanding? Of course you do. The problem with patient communication isn’t one of intent, but a misunderstanding about perception. I’ve often shown my own patients intraoral photos to explain treatment while feeling just great about this method of communication – after all, a picture is worth a thousand words, right? Well, as a whole, patients give a resounding “WRONG!”

It was only when working with colleagues on the Education of the Public Committee for the California State Society of Orthodontists that I was forced to reevaluate my approach. We were developing a brochure to educate parents about orthodontics and to encourage them to schedule children for an orthodontic examination by age seven. The brochure, Bite Down Early – A Parent’s Guide to Detecting Bite Problems, illustrates six orthodontic warning signs in seven-year-olds. We wanted the brochure to have mass appeal and a professional look, so we hired a public relations firm, Nuffer, Smith & Tucker, Inc., to coordinate its design while we searched for the perfect photographs to illustrate each warning sign.

When we met to approve the design and lay out the photos we planned to use, advertising executive Sara Harper took one look at the photos and cried, “Yuck! The redness of the gums, imperfections of the teeth, and saliva are unattractive, even though these are good quality photographs. And more importantly, these things distract you from seeing the bite problem.”

We decided to reevaluate our approach. Nuffer, Smith & Tucker conducted a focus group of mothers and patients drawn from five orthodontic practices. Some of these individuals currently had children in treatment, and some had no previous orthodontic experience. When shown a series of intraoral photos and hand-drawn illustrations of malocclusions, they echoed Sara’s sentiments to the letter. They declared the illustrations to be much more pleasing to look at than the photos (“unattractive” and “gross” were two words used to describe the photos). More importantly, they felt the illustrations to be clearer and easier to understand.

This process resulted in the use of illustrations in our booklet rather than photographs. Cheryl Dine, the artist, summarized the process: “Photos were confusing and sometimes alarming for the mothers we were trying to reach. If we’d been doing the kit for orthodontists only, we might have gone with them; however, as we were trying to reach the patients and parents, photos would have been a mistake.”

Ormco has also reinforced this message by including beautifully done animations in their new Interact-Consult treatment plan explanation CD-i tool. Robin Elledge, who helped develop this product, explained that she learned about the dangers of intraoral photos while trying to show photos in orthodontic journalism to friends. They often turned away in disgust. Ormco took the idea of graphic illustrations one step further by animating them to show the teeth moving as a result of treatment. The very popular Interact-Consult CD-i disc (an updated disc was just introduced in May) is a wonderful tool for explaining complex orthodontic procedures that are virtually impossible to understand with verbal explanation, photographs, illustrations or typodonts alone.*

The Bite Down Early brochure has since been published and is receiving rave reviews from orthodontists and patients around the country. The booklets are helpful as an adjunct to activities at health fairs and community presentations as well as with referring dentists. They include pre-marked bite sticks so parents can measure their child’s overjet.*

continued on page 23

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only in the strong muscular patterns, as it contributes to the bite-opening process and aggravates tipping of the molars.

4. Stops on archwires
(Figs. 12-15)

**Indications for Use:** Whenever the first leveling or continuous archwire is placed in the upper arch, bent-in or pinch-on stops should be placed mesial to the upper molar buccal tubes. This will prevent the upper molars from sliding forward along the archwire and the subsequent loss of anchorage. These first archwires start the uprighting process in the molar region that will take place over many months.

**Technique:** If a stainless steel archwire is used, small vertical steps or omega loops at the buccal tubes will suffice. Where a more resilient (Ni-Ti, Copper Ni-Ti) archwire is needed for leveling and bracket engagement, the archwire is placed without any stops. Pinch-on stops are then placed at the buccal tube.

**Considerations:** By placing a stop at the molar, any rebound will be expressed as flaring or forward movement of the upper arch. Therefore, other anchorage techniques must always be used in conjunction with stops on the archwire.

5. Upper utility arch (Fig. 16)

**Indications for Use:** An upper utility arch is, in effect, using the upper incisor teeth as the anchorage unit in maintaining the distalized molar position. It is the archwire of choice for several reasons. (1) The utility arch can be placed without full eruption of the buccal segment teeth, a quite common situation due to treatment timing. (2) The vertical step on the utility arch places an automatic stop at the molar. (3) There is no loss of anchorage caused by archwire friction when retracting the buccal segments. These teeth can be free-floated back into a Class I relationship when using a utility arch. (4) In Cl II, D 2 cases, the reciprocal force of incisor advancement is utilized to hold the upper molars back. (5) There is immediate torque control in the upper incisors using a square or rectangular archwire that is not achieved with a round leveling archwire. (6) If Cl II elastics are going to be one of the anchorage sources (see #8), the utility arch acts as the forward purchase point for the elastics.

**Technique:** The upper utility arch is fabricated from either .016 x .016 Azurloy™ or .017 x .017 TMA®. The molar tipback should generally just accommodate the molar's tipping, as attempting to intrude the upper incisors at this time only serves to further tip the molars.

**Considerations:** Rebound at the molar region will result in upper incisor flaring and possibly an open bite. The upper utility arch is best used in deep bite patterns where the reciprocal response of incisor advancement is desirable. The upper buccal segment teeth can be free-floated distally using a light elastomeric chain attached to the molar hook. If the space between the second bicuspid and molar is large, skip one of the elastomeric links.
6. Push coil springs at cuspid region (Figs. 17 and 18)

**Indications for Use:** The most effective way to retract the upper buccal segments without forward movement of the molars is with a push coil between the lateral incisors and first bicuspids. It is ideally utilized when: (1) The upper cuspids lack enough space for eruption. (2) The upper incisors can be flared to clear the lower arch for bonding.

**Technique:** An upper continuous (usually reverse curve Ni-Ti) archwire is placed with Ni-Ti push coil in the cuspid regions. A pinch-on stop at the molars prevents their forward movement along the archwire. The archwire is not cinched or tied back.

**Considerations:** If the upper incisors are already flared (Cl II, D I), this technique will increase the overjet. It is ideally utilized in the Cl II, D II malocclusion where it is beneficial to advance the incisors, round out the anterior arch form and create room for blocked-out cuspids.

7. Early bonding of the upper arch (Figs. 19 and 20)

**Indications for Use:** Increasing anchorage in the upper arch by adding tooth units is a very effective way to maintain the gain. Typically, the upper bicuspids have a tendency to come forward slightly (about 1/3 of the movement) while the upper molars move distally. This is particularly true when the upper deciduous cuspids have been lost and the permanent cuspids are either unerupted or blocked out of the arch. This is very common due to the timing of Pendulum therapy and the tendency for blocked cuspids in Class II malocclusions. The bicuspids can very easily come forward, further impacting the unerupted cuspids. It is very important that the cuspids eruption site either be maintained or increased during the Pendulum phase of therapy.

**Technique:** The upper arch is bonded at the same time that the Pendulum Appliance is placed. A push coil is added between the lateral incisors and first bicuspids and a sectional leveling wire (.016 Ni-Ti) is placed to the midline. These left and right sectional wires are stopped at the midline so that the midpalatal jackscrew can be activated and upper arch expansion can occur. Using a continuous arch prevents the maxillae from separating at the midline.

**Considerations:** In severe Cl II, D I maloclusions with a large overjet where the upper incisors are already flared, early bonding can further exacerbate the incisor proclination. Early bonding is ideal in the Cl II, D 2 malocclusion, however, as the reciprocal forward movement of the incisors clears the lower arch for future bonding, improves incisor torque, opens space for erupting cuspids, frees the mandible from distal displacement and greatly enhances upper molar movement. All of these are quite desirable responses in the Cl II, D 2 brachyfacial malocclusion, where midfacial orthopedics can create maxillary deficiency with negative esthetic consequences.

8. Class II elastics (Fig. 21)

**Indications for Use:** Class II elastics are quite effective as an anchorage source when it is desirable to advance or develop the lower arch forward. The retruded lower arch is quite common in strong facial patterns and can be utilized quite effectively to help achieve overall facial continued on following page
Technique: An .040 lip bumper with a soft covering in the labial vestibule is adapted above the upper incisor brackets. Normally, a vertical step of 5-8mm is bent mesial to the upper molar headgear tubes. The bumper is tipped back passive to the upper molar position to locate the anterior portion properly in the vestibule and can be tied in.

Considerations: The upper lip bumper is an ideal anchorage unit when one is not actively trying to retract the upper buccal segments. When the buccal teeth can be "floated" distally or in late mixed dentition, the upper lip bumper can be utilized. It is also used in conjunction with other anchorage sources.

10. Clear-(slipcover) or Hawley-type retainers (Fig. 23)

Indications for Use: After Pendulum Appliance removal, it is often beneficial to place a retainer as an interim device for other mechanics. If the tissues are unduly inflamed or irritated, it's beneficial to allow a week or two of tissue rebound to occur prior to placing a more secure anchorage appliance, such as a Quick-Nance. A clear-type retainer (slipcover) is ideal because it can be made immediately on a Biostar machine and is easily and cheaply fabricated. It also has the benefit of not touching the palatal tissue, permitting it to heal easily. The clear retainer is also an excellent interim retention device while a Bionator or Herbst appliance is being fabricated. A Hawley retainer is also used as a retention device in Phase 1 therapy.

Considerations: Again, compliance can be a problem. If the patient fails to wear the retainer for even a few days, the rebound of the upper first molars can be enough to keep it from fitting over the teeth. This is particularly true with the clear retainer because the adaptation to the teeth is so critical.

11. Bionator (Figs. 24-26)

Indications for Use: The Bionator or removable functional appliance is used for Pendulum anchorage in those brachyfacial types with short mandibular corpus length. It serves to maintain the distalized molar position while developing the lower arch forward.

Technique: After the Pendulum Appliance is removed, impressions and construction bite for the Bionator are made. A second impression of the upper arch is taken and a clear retainer made and placed. The Bionator is fabricated with a clip spring mesial to the molar or the bicuspid-molar space is filled with acrylic. With the Bionator in place, the molar will be in a full step (almost a full tooth) Class III relationship. This allows the upper buccal segments to erupt in more distal positions. The space is maintained until full eruption of the dentition and then released for space closure.

Contraindications: The functional appliance requires cooperation, so it is intended for those with high responsibility levels.

12. Short-haul Herbst appliance (Figs. 27-29)

Indications for Use: The short haul Herbst* appliance is intended mainly as a short-term anchorage appliance following Pendulum therapy (although many clinicians consider it the Herbst appliance of choice for its simplicity and its functional and growth benefits). It is utilized where headgear cooperation is questionable and the permanent dentition is either in place or almost erupted.
The appliance is simplified greatly for comfort by attaching to the lower first bicuspids and upper molars only. This version of the classical Herbst appliance is easy to use, allows for adjunctive bonding and space closure of the upper arch and supplies some of the classical functional responses commonly attributed to this fixed functional appliance. In effect, it is like having a headgear on full time while the upper buccal segments are being retracted to the molars. Although there is some strain on the lower arch, we have found it to be minimal, as the Herbst appliance ultimately puts very little strain on the appliance itself once muscle memory has been altered.

**Technique:** To fit crowns on these teeth, the upper molars cannot be severely tipped distally. We commonly move the upper molar back into an ideal Class I relationship (don’t overcorrect it excessively), and although some distal tipping is allowable, it should be minimized. The Pendulum Appliance is removed and the slipcover is fabricated. Upper first molars and lower first bicuspids are fitted with stainless steel crowns. The upper hubs are welded to the distal of the upper molar crowns and impressions taken to fabricate the short-haul Herbst appliance. Small Mini-Peerless tubes are welded to the mesial of the upper molar stainless steel crowns in order to retract the upper buccal segments. A short lingual arch (.050 stainless steel) is soldered to the lower first bicuspids for stability. The upper arch is bonded and retracted to the upper molar, using the short-haul Herbst for anchorage. The Herbst appliance can be left in longer if needed for other functional and growth responses, but its main purpose is to work as an anchorage unit while retracting the upper arch.

**Considerations:** Once the upper buccal segments have been retracted, there will be a large space between the upper lateral incisors and upper cuspids. The upper incisors will be in an ideal overbite and

continued on following page
overjet relationship because the mandible is advanced to hold molar position. The upper incisors cannot be retracted until the Herbst appliance is removed and overjet recurs. The short-haul Herbst is often left in during the alignment and leveling phase in the lower arch. Then the upper incisors are retracted with a Reverse Curve TMA with “T” Loops closing arch to open the bite and consolidate upper spaces.

13. Long-haul Herbst appliance (Figs. 30-35)

**Indications for Use:** The long-haul Herbst appliance is used to accomplish long-term functional responses common to Herbst appliance therapy and also to serve as the anchorage unit to hold the upper molars back following Pendulum therapy. This appliance is most commonly used in conjunction with the Pendex Appliance in Phase 1 therapy, long before the permanent upper buccal segments have erupted. The most typical case would be the brachyfacial Class II that has a short corpus length and retruded lower face. In these cases, it is not ideal to retract or orthopedically reduce the maxillary complex (à la headgear) and yet dental movements are acceptable and desirable.

**Technique:** The cantilever Herbst appliance (see Mayes’ article, Clinical Impressions, Vol. 3, No. 2, 1994) is most commonly used for this function. Following use of the Pendex appliance, where maxillary expansion is accentuated and distal tipping of the molars minimized, crowns are fitted and the cantilever Herbst appliance fabricated. A slipcover retainer is placed the day of Pendex removal to assure maintenance of the dental and expansive changes.

**Considerations:** The long-haul Herbst appliance must be in place long term (over 12 months) to garner some of the orthopedic and orthodontic results attributed to this appliance. This combination of Pendex and long-term Herbst appliance is a very dynamic Phase 1 therapy that holds great potential in early treatment. The results to date have been very encouraging and improvements in technique come on almost a daily basis.

**Analysis of Initial Response in 13 Sequentially-Treated Pendulum Cases** (Patients 1-13)

**Case Selection:** Thirteen sequentially-treated Pendulum Appliance cases are demonstrated to show the initial

![Figure 30. Model for long-haul Herbst appliance. Hubs have been soldered to disto-buccal of upper molar crowns. Note large space distal to upper bicuspids created by prior use of the Pendex appliance. Arch form and expansive changes have also been achieved by this appliance. The long-haul Herbst will be in place for 12-16 months to develop the mandible. It also acts as the anchor unit to retract the upper buccal segments.](image)

**Figure 31. The cantilever long-haul Herbst on the models positioned by hand to measure axis length. Note the super Class III relation of the upper molars.**

![Figure 32. The framework of the long-haul (cantilever) Herbst appliance. Used most often in the mixed dentition.](image)

**Figure 33. The long-haul Herbst on the models with the axis in place, just prior to cementation. The upper arch width and distal molar position have been maintained with a clear retainer placed immediately after Pendex removal.**

**Figure 34. The cantilever Herbst in place. Note the upper molars in Cl III relation and cuspids now in Cl I relation. The long-haul Herbst serves not only as the anchorage unit to retract the upper buccal segments but also to bring about functional changes.**

**Figure 35. The upper arch is strapped-up and ready for buccal segment retraction. Even if no functional or growth changes were achieved using the long-haul Herbst appliance, the Class II malocclusion will be corrected using this exciting combination in noncompliance therapy. Sort of like wearing a belt and suspenders.**

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**Analysis:** Since there is virtually no growth during the short time frame studied, it can be eliminated from consideration. The questions that the authors most wanted answered were these: (1) Is the

*continued on page 22*
Patients 1-15

photos continue on following page

Legend:
*****Excellent Overall Response
****Good Overall Response
***Average Overall Response
**Acceptable Overall Response
*Unacceptable Overall Response

Patient #1
Brachyfacial Type – Permanent dentition
• Overall Cl II correction – 5.5mm
• No forward movement buccal segments
• No downward rotation chin
• Of note: Released mandible forward slightly; intruded upper molar
• Rating of Response: *****

Patient #2
Brachyfacial Type – Mixed dentition
• Overall Cl II correction – 6mm
• No forward movement buccal segments
• Vertical reposition chin – 3mm
• Of note: Decided intrusion upper molars; distal movement second molars
• Rating of Response: ***

Patient #3
Mesofacial Type – Permanent dentition
• Overall Cl II correction – 4mm
• Forward movement buccal – 2mm
• Vertical reposition chin – 2.5mm
• Of note: Incisors retracted slightly with utility arch to molars
• Rating of Response: ***

Patient #4
Meso-brachy Type – Mixed dentition
• Overall Cl II correction – 6.5mm
• No forward movement buccal
• Vertical reposition chin – 1.5mm
• Of note: Incisors retracted greatly; excellent Cl II correction
• Rating of Response: *****

Patient #5
Brachyfacial Type – Mixed dentition
• Overall Cl II correction – 12mm
• Forward movement buccal – 3mm
• Vert-forward position chin – 7mm
• Of note: Combination mechanics with Bionator; very large overcorrect
• Rating of Response: *****
Patient #6
Brachyfacial Type – Mixed dentition
• Overall Cl II correction – 5mm
• No forward movement buccal
• Vertical reposition chin – none
• Of note: No bite opening; excellent anchorage for deciduous teeth
• Rating of Response: *****

Patient #7
Meso-brachy Type – Mixed dentition
• Overall Cl II correction – 4.5mm
• Forward movement buccal – 2mm
• Vertical reposition chin – 2mm
• Of note: Large distal movement of unerupted second molars
• Rating of Response: ****

Patient #8
Meso-brachy Type – Mixed dentition
• Overall Cl II correction – 5.5mm
• Forward movement buccal – 2.5mm
• Vertical reposition chin – 1.5mm
• Of note: Excellent distal movement erupting second molars
• Rating of Response: ****

Patient #9
Meso-brachy Type – Permanent dentition
• Overall Cl II correction – 3mm
• Forward movement buccal – 2mm
• Vertical reposition chin – 2.5mm
• Of note: Larger bite opening for smaller Cl II correction
• Rating of Response: ***

Patient #10
Brachyfacial Type – Mixed dentition
• Overall Cl II correction – 6mm
• Forward movement buccal – 2mm
• No vertical reposition chin
• Of note: Excellent response with few negative side effects
• Rating of Response: *****
Patient #14
Summary Description of Problem:
Class II, D I, deep bite, brachyfacial type with maxillary deficiency, mild double dental protrusion, blocked upper cuspids and no crowding. Diagnosis focused on maintaining lower arch stability.
Treatment Summary:
Treatment initiated with a Pendex (3 months) and stabilized with a Quick-Nance appliance. An upper utility arch was used to open the anterior bite, clear the lower arch for bonding and buttress anchorage. The upper buccal segments were retracted followed by upper incisor intrusion and retraction with a Reverse Curve "T" Loop TMA archwire. The lower arch was leveled with a reverse curve rectangular Ni-Ti followed by a lower ideal arch. Only vertical seating elastics were utilized. Total treatment time 17 months. Superimposition of the lower arch reveals relative stability.

Patient #15
Summary Description of Problem:
Class II, D I, deep bite, brachyfacial type, mild double dental protrusion, narrow maxillae, blocked eruption upper cuspids and E-space available. Borderline extraction case.
Treatment Summary:
Treatment initiated with Pendex (3 months) followed by a Quick-Nance appliance for stabilization. Push coil on a reverse curve Ni-Ti retracted the upper buccal segments. A lower arch-length maintainer saved the lower E-space and ONLY vertical seating and midline elastics were utilized. Total treatment time 19 months. Superimposition of the lower arch reveals relative stability.
upper molar tipped, extruded, or intruded during Pendex therapy? (2) What was the reciprocal anchorage loss on teeth anterior to the distally moving molars? Was there any difference when the appliance was attached to deciduous or permanent teeth? (3) What is the effect on erupting second and third molars? Do they limit distal movement of the upper first molars? (4) What is the net overall change in upper molar position relative to lower molar position (effective Cl II correction)? (5) What was the response of the mandible to such rapid Class II correction? Was there an excessive counterclockwise rotation of the chin? (6) Is the interproximal bone apposition healthy? Did the moving teeth suffer root resorption? Were there greater impactions in the second and third molar regions? The lateral cephalometric headfilms were superimposed at the “best fit–cortical and medullary bone” locations to answer these questions.

**Analysis of Long-Term Response in Finished Cases**

(Patients 14-15)

The cases selected were full-step Class II malocclusions in which Class II elastics were never used. The only elastics worn were vertical seating elastics. They are strong facial patterns with good maxillo-mandibular relationships, and the facilitating mechanics in these cases were the Pendex Appliance and concomitant growth.

**Conclusion:** It is clear that the future of orthodontic mechanotherapy will include more and more forms of noncompliance therapy. Quality results will depend on predictability and less on the whims and responsibility levels of individual patients. This is a socialized phenomenon over which we have very little control. Larry White’s description of noncompliant patients as “turtles without shells” seems to be an apt metaphor. This two-part article is not meant to be the final chapter in the search for noncompliant technology, only the beginning. The sense that we do have some control over the outcome in many cases can only give us greater focus and feeling of accomplishment. Stress levels and confrontations should diminish. This appliance and its applications are not meant to replace other forms of mechanotherapy – only to be an adjunct to them. We are simply trying to add more arrows to our quiver. In the right cases with the right diagnoses, noncompliance therapy can work wonders. At times, pursuing this goal can appear to be elusive, but the authors have found the pursuit to be well worth the effort.

*Herbst is a registered trademark of Dentaurum, Inc.*

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*Pendulum continued from page 18*
pain occurs when a splint is first worn, you need to reduce the time that the splint is worn and attend to the neck first (physical therapy or other referral).

For orthodontists, the easiest part of the examination tends to be the occlusal and skeletal system. However, besides the standard orthodontic evaluation, special care should be given to functional movements. Do they follow gnathological principles? Is cuspid guidance present, etc.? Be especially mindful of the patient’s facial pattern based on the mechanics as described in Part I of this article. Is it a vertical or horizontal pattern? Where are the wear patterns on the teeth? What muscles would be affected by this structure? For example, the patient with a vertical facial pattern would have wear on the posterior teeth. They would tend to have a forward head posture which is related to the position of the mandible and the hyoid bone. You would expect the patient to describe pain in the back of the head caused by trigger points in the posterior cervical muscles. You would also expect pain in the frontal and maxillary sinus areas due to referred pain from the sternocleidomastoids and lateral pterygoids. You might expect pain behind the eye referred from a joint which is tender. Look at all the information you have gathered. See how it all relates!

Summary
By the proper use of staff and appropriate scheduling, the orthodontist can interview the TMJ patient efficiently and develop a tentative diagnosis (please feel free to call my office at [414] 886-9710 for a copy of the forms which we use). This diagnosis can then be tested by correlating the examination findings with the pain pattern of the patient, using a systems approach. By testing, the doctor can develop a more targeted treatment plan and more accurately estimate treatment time and costs. This improves not only patient satisfaction but also reduces stress and improves profitability.

Once the diagnosis has been made and tested, the process of treatment can begin. There are many different philosophies with different treatments. It is wise not to follow just one. It seems everybody is right and everybody is also wrong at times. In the future, I will discuss the various treatment modalities and how to utilize them successfully within the framework of the orthodontic practice.

In Memoriam
Dr. John D. Parker
1946-1994

On June 22, 1994, the orthodontic profession lost a very dear friend and colleague from Monroe, Louisiana, after a year-long battle with cancer.

Dr. Parker had established a very successful orthodontic practice in Monroe, Louisiana, since 1975. He obtained his dental degree in 1970 from the University of Tennessee and his specialty training from St. Louis University in 1974 after a tour of duty with the U.S. Air Force in California and Thailand.

For those of us who were fortunate enough to have known John, he will always be remembered for his spontaneous humor and wit, accompanied by that constant, contagious smile. John was a very special person and colleague who was always striving to learn more about not only the practice of orthodontics, but also the management of an orthodontic practice. John was truly a lamp of knowledge that radiated and shared information with anyone who asked.

Dr. Parker was a diplomate of the American Board of Orthodontics and a member of the American Association of Orthodontists, the Southwestern Society of Orthodontists, the American Dental Association and the Louisiana Dental Association. He is survived by his wife of 28 years, Laura, and their two children, Mimi and Randy.

We'll miss you dearly, John Boy!!

Dr. Tom R. Stewart, Stillwater, OK
Dr. Errol Y. W. Yim, Honolulu, HI
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<td>St. Louis, MO</td>
<td>Ormco; Ms. Van Deroef (800) 854-1741, Ext. 714; Alex. Disc. Comprehensive</td>
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<tr>
<td>4/17-22</td>
<td>R. Bennett/J. Hilgers</td>
<td>Dana Point, CA</td>
<td>Drs. Bennett &amp; Hilgers; Linda (714) 830-4101; Bioprog. Tx &amp; Practical Ortho*</td>
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<td>Wick Alexander</td>
<td>Paris, France</td>
<td>AOSM; Josiane (1) 48591617; Alexander Discipline Comprehensive</td>
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<td>4/27-28</td>
<td>David Sarver</td>
<td>White Plains, NY</td>
<td>New Conn. Study Grp.; Dr. Sanders (914) 946-5860; LeFort I Osteo. Response</td>
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<td>5/4-6</td>
<td>Mario Paz</td>
<td>Beverly Hills, CA</td>
<td>Ormco &amp; Spec. Appli.; Shelly (310) 278-1681; Lingual Orthodontics</td>
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<tr>
<td>5/6-10</td>
<td>R. Bennett/J. Hilgers</td>
<td>Dana Point, CA</td>
<td>Drs. Bennett &amp; Hilgers; Linda (714) 830-4101; Practical Ortho, Intl. Doctors</td>
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<td>5/12</td>
<td>Jim Hilgers</td>
<td>San Francisco, CA</td>
<td>AAO Annual Mtg.; 9-5 Lecture— Bioprogressive Mechanics</td>
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<td>5/12</td>
<td>Michael Marcotte</td>
<td>San Francisco, CA</td>
<td>AAO Annual Mtg.; Diag. &amp; Tx Planning in 3 Dimensions,* Hands-on Workshop</td>
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<td>5/14</td>
<td>Jim Hilgers</td>
<td>San Francisco, CA</td>
<td>AAO Annual Mtg.; 1:50-2:35 Lecture—Noncompliance Therapy</td>
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<tr>
<td>5/16</td>
<td>Michael Marcotte</td>
<td>San Francisco, CA</td>
<td>AAO Annual Mtg.; Diag. &amp; Tx Planning in 3 Dimensions—Lecture</td>
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*Typodonts and/or Participation

For sponsors’ addresses or other course information, call Ormco – Marilyn Van Deroef (800) 854-1741, Ext. 714, or (818) 852-0921. International doctors, please contact your Ormco distributor.
The 2nd annual session of The Gorman Institute for Practice Enhancement is almost here. The select faculty, emphasis on practical answers to clinical and management problems, and outstanding recreational and social activities will provide a jump-start for success in '95. Here's a thumbnail sketch of the program:

**Chuck Alexander** – Consistent board-quality results
**Craig Andreiko** – The Orthos™ Appliance System
**Rand Bennett** – Generating staff cooperation – not conflict
**Richard Boyd** – Efficient management to maximize profit
**Jerry Clark** – Creating raving fans for your practice
**Jim Davis & Reid Simmons** – Computer technology update
**Terry Dischinger** – The Herbst appliance
**Jim Eckhart** – Sleep disorder and snoring treatment
**Gary Heil** – Creating a sense of ownership in the staff

**Jim Hilgers** – Early treatment and functional problems
**Randall Moles** – Attracting quality patients
**David Sarver** – Selling and delivering beauty and esthetics
**David Schwab** – Increasing referrals and case acceptance
**Bob Smith** – Clinical approach to improved profitability
**Mike Swartz** – Variable modulus mechanics for efficient treatment
**Charlene White** – Igniting vitality in your team

**Didier Fillion, Courtney Gorman, Mario Paz, Kyoto Takemoto** – Two-day, hands-on course on lingual orthodontics

For additional information or to receive the complete course schedule/brochure, contact the Gorman Institute at (800) 646-8687, fax (813) 644-8400 or write to: Dr. Winston Morris, The Gorman Institute, 4740 Cleveland Heights Blvd., Lakeland, Florida 33813.

Ormco’s new line of surgical grade stainless steel crowns is ideal for Herbst therapy. The high grade construction is designed to withstand Herbst-level stresses. Ormco is introducing a complete line of crowns, with a full range of sizes, to meet all of your Herbst and space maintenance needs. The stainless steel crowns are available in kits of 84 crowns each, distributed according to popular usage. Crowns can be reordered in packages of five/size. See page D of this Center Section for order information.

To Order
Call Toll-Free
800-854-1741
Current preadjusted appliances were designed almost 30 years ago, utilizing the technology of the time. Over the past five years, Dr. Craig Andreiko has been involved in research applying modern CAD/CAM technology to both human anatomy and appliance design to achieve a higher level of orthodontic precision and efficiency. Dr. Andreiko’s visionary concepts have been realized with the introduction of Orthos™, a new preadjusted appliance system that is both more clinically friendly and more comfortable for the patient. Orthos was recently introduced to the profession in the August 1994 edition of the *JCO* in an interview of Dr. Andreiko by the editor, Dr. Larry White.

The Orthos System was developed from CAE measurements (consisting of highly complex digital codes) of over a hundred cases to achieve unprecedented precision in determining “ideal” anatomical averages. Bracket specifications were then calculated based upon actual clinical bracket placement rather than theoretical standards. Resulting are the ideal bracket and buccal tube geometries, archwire shape and bracket placements that will consistently optimize occlusion. Mechanical inefficiencies inherent in all orthodontic systems, such as lost torque in the archwire slot and force diminution, were then taken into consideration. Orthos appliances were designed to compensate for these inefficiencies and to enhance clinical performance.

In this context, Orthos is the first truly concurrently-designed system – a coordinated system that minimizes many of the most common problems experienced in day-to-day practice.

**Orthos - Achieving Optimal Occlusion with Greater Clinical Efficiency**

**Dramatic increase in lower anterior precision, comfort and efficiency** - The Orthos prescription bracket is provided in the Mini Diamond® configuration. Rotation is cut into the slot of the lower cuspid brackets and the shape of the archwire is adjusted to sweep as close to the tooth surface as is practical, dramatically reducing the profile of the lower anterior bracket. Unlike earlier preadjusted appliances, the correct in/out relationship between lower cusps and laterals minimizes the commonly required first order bends mesial to the cusps. Occlusal interference and placement difficulties are reduced while hygiene and comfort are improved. Progressive distal tip built into all lower anterior brackets improves uniformity in root spacing.

**Redefined, more precise posterior segments** - Conventional brackets are designed to be placed at the inciso-gingival center of the tooth, but mandibular brackets are commonly placed below this point to avoid interference, resulting in increased torque and “dumping” of the mandibular posterior segments. Orthos torque values have been reduced in the mandibular posterior segments to decrease lingual crown inclination as well as improve first order relationships. Moderately increased buccal root torque in maxillary posterior segments prevents

---

**Rotation In Slot (RIS)** - Rotation is cut into the slot of the maxillary lateral and mandibular cuspid brackets. This RIS process allows for the manufacture of the lowest profile brackets possible.

*Patent Pending*
dangling lingual cusps. Lower bicuspid brackets are designed with distal root tip to achieve level marginal ridge contacts; distal root tip is incorporated into upper second bicuspid brackets to reduce height-discrepancy problems between marginal ridges. Thicker upper second bicuspid brackets reduce requirements for first order bends mesial to molars.

**Systematized efficiency** - Orthos arch forms are derived from skeletal analysis and mathematically formulated to coordinate arches and maximize clinical efficiency of both brackets and wires.

Orthos archwires are available in the broad spectrum ofOrmco’s metallurgical options, including TMA®, Ni-Ti®, and stainless steel. Appliance parameters are shifted to reflect a more modern approach to expansion mechanics. Ormco’s patented Optimesh™ coating is applied to all Orthos bases, increasing bond strength by 35%*. Bicuspid brackets are available as an option with the popular gingivally-offset placement on bonding pads that are extended occlusally to increase the bond area. Bracket positioning gauges customized to Orthos requirements facilitate accurate placement.

### Orthos Appliance Specifications

The Orthos System is available in .018 and .022 Mini-Diamond® Optimesh™ brackets with disto-gingival hooks optional on cuspsids and bicuspids and with optional gingivally-offset bracket placement on occlusally-extended bicuspid bases that extend the bond area. A full range of 1st and 2nd molar buccal tubes (single, combination, double and triple; convertible and terminal) is provided. Buccal tubes are available on Optimesh pads or can be ordered prewelded to any Ormco molar band. Single-patient kits are available as a convenient option.

See Page D of this Center Section for complete order information on the Orthos System.

### Orthos Bracket Specifications

<table>
<thead>
<tr>
<th>Torque</th>
<th>+15</th>
<th>+9</th>
<th>-3</th>
<th>-6</th>
<th>-8</th>
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<td>5°</td>
<td>9°</td>
<td>10°</td>
<td>0°</td>
<td>4°</td>
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**Maxillary**

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<th>-6</th>
<th>-7</th>
<th>-9</th>
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<tbody>
<tr>
<td>2°</td>
<td>3°</td>
<td>3°</td>
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**Mandibular**

*A summary report of Optimesh testing is available upon request.*
How To Order: Phone (800) 854-1741, (818) 852-0921 or your Ormco representative. Fax (818) 852-0941. Or mail this form to: Ormco Corporation, 1332 South Lone Hill Avenue, Glendora, CA 91740-5339. Be sure to provide name and address.

**Stainless Steel Crowns** 84-crown kits
Reg. $189.50/kit, Now $132.65/kit.
Indicate no. of kits:
U & L Molars: 1st Perm., 2nd Perm.,
1st Primary, 2nd Primary,
U & L Bicusps: 1st, 2nd,

**Bondable 3 x 3 Lingual Retainer Kit**
21 appliances in 7 sizes distributed by usage
Reg. $99.05/kit, Now $74.28/kit
Indicate no. of kits:

**Orthos™ Mini-Diamond® Twin/Optimesh™ Brackets**
Reg. $5.95/bkt, Now $3.87/bkt;
Reg. $6.55/bkt w/hk, Now $4.26/bkt w/hk
5 x 5; indicate options desired: .018, .022

**Orthos™ Peerless® Tubes** w/integral mesial hooks
Prewelded to Ormco Molar Bands – Assemblies discounted 35%
Upper or Lower Sampler Kits – 200 assemblies distributed by usage
Price of kit reflects 35% discount
Indicate type of bands ordered:
1st Molars: Trimline™, Ultima, Washbon, Mark II
2nd Molars: Trimline™, Washbon
Lingual attachments – 35% off (no charge for seating lugs)
Describe lingual attachment desired:

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<thead>
<tr>
<th>Description</th>
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<th>.022</th>
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<td>.017 x .025</td>
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<td>Stainless Steel</td>
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<td>TMA®</td>
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<tr>
<td>Ni-Ti™ 35°</td>
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<td>Ni-Ti™ 40°</td>
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<td>Copper</td>
<td>.016</td>
<td>.018</td>
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Check appropriate spaces to order each sampler kit

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<th>Kit Costs</th>
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<td>Torque-10°, D.O. 15°</td>
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<td>Upper 2nd Terminal, Tq. -10°, D.O. 12°</td>
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<td>785.20</td>
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* Distal Extension

Orthos™ Bracket Positioning Gauges (U & L)
Reg. $79.00/set, Now $63.20/set
Indicate no. of sets: .018; .022

Orthos™ System Wire Selection
10 Kleen Paks™/pk
Any mix of 1-6 pks -20%; 7-15 pks -25%; 16 pks + -30%
Indicate no. of pks ordered in appropriate spaces

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<th>Maxillary Large</th>
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<th>Mandibular Large</th>
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<td>.017 x .025</td>
<td>.019 x .025</td>
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* Distal Extension

Name ___________________ Phone ___________________
Address ___________________
**Order Information**

Descriptions and catalog numbers of products introduced or discussed in this issue are provided to facilitate your ordering. Please contact your Ormco representative or distributor for additional information.

### Bondable 3 x 3 Lingual Retainer Kit - 204-0101

21 appliances in 7 sizes distributed by usage.

### TMA® Pendulum Spring Kits

- **Intro (5 lefts/5 rights)**: 225-0034
- **Lab L (10 left springs)**: 225-0035
- **Lab R (10 right springs)**: 225-0036

### Stainless Steel Crowns

Kits of 84 crowns, U & L, distributed according to usage. Crowns can be reordered in packs of 5/size.

- **1st Permanent Molar**: 421-0000
- **2nd Permanent Molar**: 424-0000
- **1st Primary Molar**: 417-0000
- **2nd Primary Molar**: 419-0000
- **1st Bicuspid**: 411-0000
- **2nd Bicuspid**: 414-0000

### Orthos Bracket Positioning Gauges (U & L)

- **.018 set**: 803-0190
- **.022 set**: 803-0191

### Orthos™ Mini-Diamond™ Twin/Optimesh™ Brackets

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<tr>
<td>Central</td>
<td>+9°</td>
<td>.018 Medium</td>
<td>454-0311/0310</td>
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<tr>
<td>Lateral</td>
<td>+9°</td>
<td>.018 Narrow</td>
<td>454-0612/0610</td>
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<td>Cuspids</td>
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<td>.018 Med. G.O.</td>
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<td>.018</td>
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<tr>
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<td>.018 Medium G.O.</td>
<td>454-1512/1510</td>
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<td>454-1511/1510</td>
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<tr>
<td>Mandibular</td>
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<td>.018 Left/Right</td>
<td>454-0110/0110</td>
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<tr>
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<td>.018 Narrow</td>
<td>454-0512/0510</td>
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<tr>
<td>Lateral</td>
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<td>Cuspids</td>
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*Single-Pat. Kit U/L 5-5 w/Cuspid hooks 740-1246 740-1247

### Orthos System Wire Selection

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<td><strong>TMA®</strong></td>
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<td><strong>Ni-Ti®</strong></td>
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<td>219-4103/4303</td>
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### Orthos Peerless® Bondable Tubes**

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<td>Lower 2nd Molar Bondable Double</td>
<td>Left**</td>
<td>340-4157/340-4158</td>
<td></td>
</tr>
<tr>
<td>Torque -10° Distal Offset 12°</td>
<td>Right**</td>
<td>340-4147/340-4148</td>
<td></td>
</tr>
</tbody>
</table>

*All w/mesial hks.

**Distal Extension

Available welded to any Ormco molar band

### Orthos Peerless® Tubes*

Available welded to any Ormco molar band

<table>
<thead>
<tr>
<th>Description</th>
<th>U/C HG Tube</th>
<th>.018</th>
<th>.022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper 1st Molar Combination</td>
<td>Left</td>
<td>195-0212/195-0211</td>
<td></td>
</tr>
<tr>
<td>Torque -10°</td>
<td>Right</td>
<td>196-0212/196-0211</td>
<td></td>
</tr>
<tr>
<td>Distal Offset 15°</td>
<td>Left</td>
<td>197-0212/197-0211</td>
<td></td>
</tr>
<tr>
<td>Upper 1st Molar Triple</td>
<td>Left</td>
<td>173-0422/173-0421</td>
<td></td>
</tr>
<tr>
<td>Torque -10°</td>
<td>Right</td>
<td>174-0422/174-0421</td>
<td></td>
</tr>
<tr>
<td>D.O. 15°</td>
<td>Left</td>
<td>175-0422/175-0421</td>
<td></td>
</tr>
<tr>
<td>Upper 1st Molar Double</td>
<td>Left</td>
<td>171-0412/171-0411</td>
<td></td>
</tr>
<tr>
<td>Torque -10°, Distal Offset 12°</td>
<td>Right</td>
<td>172-0412/172-0411</td>
<td></td>
</tr>
<tr>
<td>Lower 1st Molar Single</td>
<td>Left</td>
<td>189-0300/189-0299</td>
<td></td>
</tr>
<tr>
<td>Torque -10°, Distal Offset 0°</td>
<td>Right</td>
<td>190-0300/190-0299</td>
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</tr>
<tr>
<td>Lower 1st Molar Double</td>
<td>Left</td>
<td>171-0412/171-0411</td>
<td></td>
</tr>
<tr>
<td>Torque -10°, Distal Offset 0°</td>
<td>Right</td>
<td>172-0412/172-0411</td>
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</tr>
<tr>
<td>Upper 2nd Molar Terminal</td>
<td>Left</td>
<td>516-2204/516-2203</td>
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<tr>
<td>Torque -10°, Distal Offset 0°</td>
<td>Right</td>
<td>517-2204/517-2203</td>
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<tr>
<td>Lower 2nd Molar Terminal</td>
<td>Left</td>
<td>512-2220/512-2219</td>
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<tr>
<td>Torque -10°, Distal Offset 0°</td>
<td>Right</td>
<td>513-2220/513-2219</td>
<td></td>
</tr>
</tbody>
</table>

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*Gingival Offset

**Distal Extension

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