DR. POLLARD
CAPTURING THE ESSENCE OF THE DAMON APPROACH

DR. M. EPSTEIN, DR. J. EPSTEIN, DR. TSIBEL
MANAGEMENT OF THE DEVELOPING CLASS III MALOCLUSION

DR. MORALES
GETTING THE PERFECT FACEMASK FIT

DR. SWARTZ
RELIABLE PORCELAIN BONDING

MS. ALLEN-NOBLE
MULTIFUNCTIONAL HERBST SOLUTIONS
Clinical Impressions is pleased to introduce a new section in this issue called Case Test. The idea of the Case Test was originally conceived by Dr. Wick Alexander. He has used it as a training method with his students at Baylor College of Dentistry as well as in worldwide lectures and on the Alexander Discipline Web site (www.alexanderdiscipline.com) to provoke thought and encourage interaction among colleagues. We loved the idea so much that we asked to borrow it for CI, and Dr. Alexander graciously agreed.

At the beginning of each new Case Test, we'll provide all the information you need to accurately diagnose the case and determine a treatment plan. This includes the patient's age, chief complaint, dental history and pretreatment records. Then we'll ask you to think about how you would choose to treat the case. Later in the issue we'll present how the clinician who submitted the case chose to treat it and why.

We hope you enjoy this new section and find it to be both challenging and thought-provoking. If you would like to submit a Case Test of your own or simply provide us with feedback on one that we printed, feel free to send an email to ci@sybrondental.com.

BACKGROUND
Patient: MH
Age: 29 years 3 months
Chief Complaint: Crooked Teeth
Dental History: Distolabial fracture on incisal one third of mandibular left central, ceramic restorations on both mandibular 1st molars, and moderate gingival recession on maxillary cuspids.
Diagnosis:
Skeletal Class II
Dental Class I (left)
Dental Class III (right)
Bilateral Crossbite
8 mm Overjet
Max. ALD: 5 mm
Mand. ALD: 3 mm

Patient presents with a bilateral crossbite and a significant dental midline discrepancy in relation to the face. The maxillary arch is notably constricted (intermolar width – 29 mm) and shows an arch-length discrepancy. The mandibular arch has minor crowding and an unusually moderate curve of Spee for an open-bite case. The soft-tissue profile is within acceptable norms; however, during a full smile she displays excessive gingival tissue.

COMMENTS
Because of the transverse constriction and vertical excess of the maxilla, the patient was advised that a surgical three-piece maxillary osteotomy in addition to orthodontics would provide the best result. The patient stated that she didn’t want jaw surgery and didn’t feel that her high smile line was a problem. Her chief concern was to get her “bite fixed and teeth straight.”

So, this patient walks into your office...
Given the above information, how would YOU treat her?
To see treatment results, turn to pages 24 and 25.
It was October 2002 and I had just returned from the most exciting week of my professional life, having had the privilege of spending five days with Dr. Dwight Damon at his practice, experiencing his work firsthand. What stunned me during my visit with Dwight was just how much I had missed about his treatment philosophy and the real reason he designed his appliance to work passively. And it wasn't as if my associates and I were neophytes in using self-ligation. We have used passive self-ligating appliances for over 95% of our cases for more than five years. All in all, I felt I had a reasonable handle on maximizing the potential of the Damon System. I was wrong.

Missing the Point: Self-Ligation that Focuses on Ligation

I thought Dwight's focus was on eliminating ligatures. My first revelation when visiting him was that this was not his intent at all. Dwight actually designed the bracket to meet a much more significant clinical function. I’m not talking about the way the slide works in the bracket. Sure, that’s important from a practical standpoint, but his idea is much more powerful than that. Dwight wanted a bracket that acts like a tube because, after 30 years in orthodontics, he knew that such a conduit was the only mechanism that would give him the tooth movement he wanted using light forces. This concept is a much bigger notion than developing a more efficient ligating mechanism; this is an idea to get excited about and I can’t believe that before visiting Dwight, I just hadn’t gotten it.

What Dwight is talking about is a new way of doing the business of tooth straightening. It’s as if he’s taken the concepts of Angle and Begg, pulled out the bits worth saving and discarded the rest. What are some of those good bits? Rapid alignment with gentle forces, functional adaptation and accurate, predictable tooth positioning with micro precision. The buzz phrase of the new millennium is convergent technology and the Damon system is exactly that. It provides a well-documented means, a virtually friction-free tube, by which the most advanced wire technologies can work to their maximum advantage, an aim most of us have aspired to but have not been able to achieve in conventionally ligated edgewise systems.

I asked Dwight if he intended to prescribe a cookbook of mechanics. He emphatically replied, “no!” so I asked whether there are some things that are essential to gaining the maximum benefit from the appliance. Dwight answered, “Most definitely.” This article is my attempt to capture the essence of the Damon approach. I believe there are seven essential principles. My plan is to discuss each, giving specific ones more emphasis based on my knowledge of where the greatest misunderstandings and opportunities lie.

7 Essential Damon Principles

1. Treatment planning must be facially based.
2. Do not allow the orthodontic forces to overpower the biological system during any treatment phase.
3. The aim of the Ni-Ti® phases of treatment is not only to level and align but also to reshape the arch form specific to each individual patient through functional adaptation.
4. Complete leveling, alignment and rotational control require full-depth rectangular archwires.
5. The Working/Final Phase of treatment requires rigid wires.
6. Sagittal relationship corrections are best carried out by functional adaptation achieved via intermaxillary forces applied en masse.
7. Retention requires careful consideration.
1. Treatment planning must be facially based.

Dwight’s primary consideration in planning treatment mechanics is based on his desire to achieve the best potential facial balance for each individual patient. It’s no secret that he treats a large percentage of his cases without extractions or surgery, achieving this through functional adaptation of the arch form via a superbly efficient appliance system that, by design, takes advantage of light forces applied throughout treatment. The traditional approach to treatment planning places great emphasis on maintaining lower arch form, intercanine width, lower incisor position and the space required to align teeth without compromising this arch form. Later clinicians such as Ricketts argued for a more flexible approach with lower incisor position being dictated by intermaxillary relationships.

Dwight has taken the next logical step by asking a fundamental question, “Will this face be better served by extracting teeth?” A “no” answer begs the question of how to fit crowded teeth into the arch. Dwight has some strongly held beliefs in the potential of his friction-free appliance system to alter the balance of forces between the lips, cheeks and tongue to create an adaptive arch form within a new force equilibrium that fosters nonextraction treatment for many more cases than conventional mechanics would suggest. My experience with the appliance system indicates likewise. I just needed to understand the power of the system and trust it (Case 1, pgs. 6-7).

2. Do not allow the orthodontic forces to overpower the biological system during any treatment phase.

The paradigm underpinning the Damon approach mandates the use of low forces to create extraordinary changes in the dentoalveolar complex through functional adaptation. This adaptation greatly reduces the need for extractions and surgery versus conventional mechanics. The challenge during each phase of treatment is to avoid the temptation to increase force levels prematurely through inappropriate archwires, force retraction modules or elastics that would overload the periodontal interface between teeth and alveolar bone, negating the functional adaptation.

Membranous bone growth is appositional, and in normal tooth movement, alveolar bone is resorbed on the moving front with new bone being laid down on the trailing side. We know that under heavy forces the normal frontal resorption process quickly breaks down and an undermining necrosis occurs due to compromised vascularity. This explanation, however, is an oversimplification of the complexity of the process because the periodontal ligament (PDL) and the alveolar periosteum do have the ability to create bone during tooth movement; for example, during initial and continuing tooth eruption that accommodates vertical and lateral development of the dentoalveolus. It seems that we do not fully understand the complex relationship between the PDL and osteoblastic action. The question here is whether we can place forces on the dental arch that are great enough to move posterior teeth laterally, creating alveolar bone with the movement, yet are still under the threshold that would overwhelm the lip musculature and push the anterior teeth uncomfortably forward. In my experience, this is what this tube-like appliance system is achieving.

3. The aim of the Ni-Ti phases of treatment is not only to level and align but also to reshape the arch form specific to each individual patient through functional adaptation.

Expansion is a pejorative term for some orthodontists, although most of us employ expansion techniques at times. What I was taught as a postgraduate student was that arch expansion was only justifiable for a crossbite. The evidence in the literature is conflicting but some recent studies have indicated that changing posterior arch form is both useful and stable.

When diagnosing a case, Dwight asks himself why an arch form developed the way it did. He argues that “form follows function,” which suggests that a malocclusion is a functional abnormality. We have been debating this issue for over 100 years without any definitive conclusion, but few of us entirely disregard the functional matrix theory. Frankel employed the use of buccal shields in his appliance to achieve considerable change in arch width. The tongue function was encouraged to allow buccal drift of posterior teeth in the absence of cheek forces pushing lingually. These arch width changes have been permanent for a large percentage of cases.

Dwight argues that he creates a functional adaptation similar to the Frankel effect with very light wires in his friction-free appliance and that tipping the balance of forces in a positive direction (thereby reestablishing a functional balance) allows the alveolar process to create a new arch form specific for each individual. Dwight sees this as adaptation rather than expansion. The difference is that in using light forces to facilitate adaptation, you’re not creating an artificially preset arch form with rigid wires or other high-force means such as expanders. You’re fostering the formation of a new arch form through low-force, flexible wires overcoming the original functional abnormality. Dwight refers to this phenomenon as physiologically determined tooth position.
Pearl: After my visit to Dwight’s practice, I realized I had at times been moving into the second wire too quickly (Figures 1a-c). The objective of the initial .014 round wire is to level and align the case so that the bracket slots are on the same plane. The alveolar adaptation is an individual variable taking longer in some patients, especially adults. When you move too quickly through the Ni-Ti Phases, you may disrupt the adaptation process, shortchanging the patient in getting the amount of adaptation needed to treat the case and the face. Gearing wire changes appropriately to keep in the optimal force zone requires careful observation and decision making in both wire selection and appointment interval. At times you will need to move to an .016 Ni-Ti wire before placing a rectangular wire, especially in very crowded and deep bite cases when you need slightly higher forces to continue leveling and aligning.

4. Complete leveling, alignment and rotational control require full-depth rectangular archwires.

Some doctors have questioned achieving rotational control in a passive appliance system. In the Damon System, appropriate use of the Damon System may have negated the use of extraction therapy in this case. Case 1 illustrates a missed opportunity for using the Damon appliance to its full potential. It was one of my first cases with the System before I had heard Dwight speak. It’s a moderate Class II crowded case that I treated with premolar extractions followed by Damon System appliance therapy. Although the outcome is pleasing, there is considerable loss of lip profile with the overall retraction of anterior teeth. Today, with three years’ experience seeing the potential of the Damon System, I would treat this case with nonextraction therapy.

Figure 1a. Pretreatment. Figure 1b. After ten weeks in the initial .014 Align SE Ni-Ti wire, the case still required a super-elastic wire. An edgewise wire would have compromised arch form adaptation. At the time I used an .018 35°C Copper Ni-Ti wire; today I would simply continue with the .014 wire. While the force of the .018 35°C Copper Ni-Ti is probably about the same as an .016 Ni-Ti wire, what’s critical here is the small wire-to-lumen ratio that minimizes the friction and binding essential to arch adaption.
1c. The arch has significantly aligned (and leveled) and a rectangular archwire has just been placed. The black ends of the horizontal lines indicate the amount of lateral adaptation already achieved with the round Ni-Ti wires.

System, accurate tooth positioning requires a full-depth rectangular archwire. Full control of the teeth can only be achieved when the slot is completely filled. There is nothing wrong with the bracket or the precision of the slot; the phenomenon is inherent to a passive tube-like system and integral to the success of the Damon System. If you attempt to progress through treatment using round or non-rectangular wire mechanics, you will never achieve proper tooth positioning (Figures 2a-b). Don’t underestimate the ability of the round wire to unravel the arch, but it will not achieve total derotation of individual teeth nor should it.

Figure 2a. This figure clearly demonstrates the degree of freedom of the initial round wire in a Damon bracket. This small wire-to-lumen ratio is essential to leveling, aligning and arch adaptation in a friction-free environment, but not to rotational control. Figure 2b. In a passive system, accurate tooth positioning – including rotational control – requires a full-depth archwire to fill the slot.
I don’t believe that the adaptive arch form that the Ni-Ti wires create with the Damon System has much to do with the shape of the Damon archwire. I think the posterior adaptation results from interplay among the tongue, the alignment forces and the resistant lip musculature. During alignment with light forces in a passive system, the lips and tongue encourage the teeth to follow the path of least resistance, which is posterolaterally, so you see that movement rather than the anterior dumping that you see from a conventionally ligated appliance (Figures a-b).

Figure a. I believe the considerable adaptation you realize from the Damon System is due to the functional interplay among the light forces of the Ni-Ti wires, the tongue and the lips that causes the buccal teeth to move laterally in the path of least resistance. It’s the path of least resistance because the lower lip is maintaining incisal position.

(Note: If the canines happen to be mesially inclined, which they mostly are, their uprighting provides a powerful additional distalizing force, which may further facilitate the lateral movement of the buccal teeth. In a conventional appliance, this force is largely neutralized by friction, but in a passive appliance it is a powerful asset. The inclination of the cuspids determines whether its uprighting force is mesially or distally directed and must be taken into consideration in the treatment plan.)

Figure b. In superimposing the arch from this fully aligned case onto its original arch at the canines, you see the lateral movement of the buccal teeth. The final lower incisor position will depend upon a number of factors, including the original axial inclination of the canines and the position of the tongue.

The Working/Final Phase of treatment requires rigid wires.

The use of highly rigid stainless steel wires is the most controversial part of Dwight's approach because it seems in conflict with his philosophy of low-force mechanics. I have avoided large stainless steel wires and used TMA® because I could not escape from the heavy wires equal heavy forces idea in my mind.

The penny finally dropped halfway through my visit. A large rigid stainless steel wire does not mean ipso facto that heavy forces are applied to the teeth any more than a headgear applies force to the molars unless you activate it. Dwight uses a rigid stainless steel wire like a stabilizing splint and then force modules are applied to the entire arch. The appliance isn’t like a true splint because the teeth aren’t locked onto a rigid beam. Light-wire aficionados who have difficulty coming to grips with Dwight’s use of 6-ounce intermaxillary elastics should perhaps compare this protocol with using headgear forces of 10 ounces per side applied to upper 1st molars or to the forces a Herbst® or other new generation Class II correctors convey. Dwight applies elastic forces to a dental arch stabilized by a heavy stainless steel wire that is passive in the bracket tube system. If you have attempted to close a Damon bracket to engage a rectangular steel wire on a slightly rotated tooth, you will understand implicitly what I mean by passive.

I also think that there is opposition to the idea of space closure on a rectangular wire. The near absence of frictional resistance in the passive Damon appliance makes this argument a non sequitur. An astounding amount of space closure occurs during the Ni-Ti
Phases of treatment as a result of the interplay between the low orthodontic forces and the muscles of the lips, tongue and cheeks. Any remaining space closes without fuss with simple sliding mechanics on a posted stainless steel wire. The rigid wire should not itself generate forces in the Working/Final Phase. The stainless steel wire should be inserted in an almost passive state. The forces generated depend on closing springs or chain elastomers combined with intermaxillary elastics applied to that passive wire.

6. Sagittal relationship corrections are best carried out by functional adaptation achieved via intermaxillary forces applied en masse.

Dwight has used a Herbst appliance for 20 years, having treated most of his moderate to severe skeletal Class II cases with it. There are, however, some subtle differences between his approach and many others. He uses the appliance for 16 months on average because he wants to bring the patient’s mandible forward in staged protrusive movements of no more than 4 mm at a time. Even with the Herbst, Dwight wants to let the muscles slowly adapt to the Class I position. This protocol is contrary to a traditional approach. Dwight believes that there is less dental movement in a staged protrusion. If he’s treating patients early in mixed dentition, he will hold them in a bimaxillary splint until second phase in the permanent dentition.

Dwight will correct many mild skeletal and dentoalveolar Class II malocclusions in one stage with his appliance. Class II correction is achieved en masse with 6-ounce elastics on stainless steel archwires in the Working/Final Phase. When necessary, he employs negative torque of -6° in lower incisor brackets to discourage proclination. The intermaxillary elastics are always employed to posts on the upper archwire to spread the forces over the entire arch rather than solely to upper canines. Dwight argues strongly for the use of stainless steel over TMA archwires with Class II elastics because of better vertical control. In our practice we counter this by using lighter elastics.

**Pearl:** Having had a number of patients turn up in reverse bite in just one appointment interval, I have found that for the first time in my career I need to educate patients very carefully about elastics in the Damon appliance. Elastics work with a different dynamic in the friction-free system even when space closure is complete. Be warned: Class II correction can be very rapid.

7. Retention requires careful consideration.

There is no doubt that the Damon appliance makes significant changes to arch form. The arch form is created by altering the balance of muscular and soft-tissue forces within the oral environment with the addition of light alignment forces from the initial elastic archwires. He argues that the distortion of arch form results from a misfiring somewhere in the functional matrix during development and maturation and reverses this situation with gentle archwire forces. He suggests that the tongue’s resting position changes during treatment to occupy a higher location in the palatal vault, creating a new force equilibrium. Dwight utilizes a number of retention strategies, which to me seem intrinsic to his approach. He commonly employs what he calls a bimaxillary splint, which is a simply constructed device made of two sheets of biocryl vacuum-formed and joined together by cold-cure acrylic in a bite relationship carefully registered to maintain any Class II correction (Figure 4). The beauty of this simple device is that it maintains the transverse arch adaptation achieved in the alignment phase.

Dwight also uses bonded retainers, routinely canine-to-canine in the lower arch and on two or four upper incisors. Patients will also wear an Essix*-type removable retainer. Retention procedures are all simple and economical. He emphasizes the importance of retention to his patients and the shared responsibility involved.

Does Dwight believe in permanent retention? The answer to that appears to be a qualified *sometimes*. It appears from the evidence available that there is no absolute treatment or retention rationale that will guarantee long-term stability. Given the choice between beautiful occlusions, facial balance and healthy periodontal tissues maintained with some form of long-term retention or a more traditional limited retention approach, I know what I would personally choose. Judging by the opinions of his patients in retention, many of them older adults whom I met, I think they would wholeheartedly agree.

*The Damon System is an exciting revolution. It is also a work in progress. The system itself offers a significant efficiency gain in treatment delivery. Dwight believes that his treatment approach combined with his appliance system will allow you to achieve outcomes for your patients that are not easily attained with conventionally ligated bracket systems. I believe he is right.*

*Herbst is a registered trademark of Dentaurum, Inc.

**Essix is a registered trademark of Raintree Essix, Inc.

REFERENCES:


One of Dr. Pollard’s cases concludes this article on pages 10-11.
CASE 2

PRETREATMENT/TREATMENT PLAN
Female, 11 years 4 months. Class II, division 2 with large overjet, moderate crowding, excessive display of upper incisors, moderate lip strain and obtuse nasolabial angle. Narrow maxilla. Mesofacial pattern. Phase 1: Employ Type II Herbst with rapid maxillary expansion (7 mm). Phase 2: Employ full fixed Damon System 2 appliances. Consider premolar extractions after Herbst and expansion therapy. Goal: Reduce Class II but minimize loss of upper lip profile.

AFTER 12 MONTHS OF HERBST/EXPANSION, the patient demonstrated overjet reduction to Class I and considerable maxillary arch expansion. Decided to continue nonextraction therapy with the Damon appliances and accept mild lower incisor proclination rather than the potential loss of upper lip profile with extractions. Initial archwire: .020 x .020 35˚C Copper Ni-Ti with 0˚ of lower incisor torque. Today I would use an .014 dimension wire with -6˚ of lower incisor torque. After 12 weeks, employed .019 x .025 Low-Friction TMA (purple) in both arches.

AT 22 WEEKS, the arches were well aligned. The plane of occlusion showed a tendency toward a lateral open bite on the left side. Employed a hook between the upper left lateral and upper left cuspid to accommodate placement of a short vertical Class II elastic from the upper left lateral to the lower left 1st bicuspid, worn throughout the remainder of treatment.

AT 45 WEEKS, placed a full-sized Copper Ni-Ti archwire in the lower arch to allow final settling of the lateral open bite. Kept Low-Friction TMA in the maxilla. Now that I’ve visited Dwight, I know that placing a V elastic on the upper anterior post, bringing it under the lower 1st premolar hook and up to the 1st molar is an effective elastic configuration for settling final buccal occlusion.

POSTTREATMENT
We debonded the patient after 12 months of treatment (5 check visits; 2 emergency visits) for a total active treatment time of 24 months (Herbst, expansion and fixed Damon appliances). Bonded a mandibular retainer 3-3 and placed a maxillary Hawley retainer for retention.

The cephs show a minor improvement in the mandibular profile with some loss of upper lip profile due to the significant retraction of the upper incisors and lower incisor proclination. The patient and I are quite pleased with the result, especially given that we decided to forego extractions.
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- **Titanium Orthos2 Buccal Tubes**, innovative material & design for reliable molar bonding
- **Toothprints**, the dental ID for safeguarding children

**FEATURED SITES**

DAMONSYSTEM.COM
Learn about the philosophy behind the passive Damon System, find answers to frequently asked questions, get help selecting the right torques and archwires for each case, read published articles on the Damon System, examine cases treated with the Damon 2 appliance and even submit questions to Dr. Damon himself. This is the do-it-all site for any clinician interested in low-force, low-friction orthodontics.

AOA-PRO.COM
Read about new products and services, such as the popular Red, White & Blue appliance, download various appliance prescription forms as well as manuals for the Herbst* and MARA, find information on shipping and handling, watch presentations by leading clinicians and view the latest AOA Newsletter.

ORMCO.COM/TOOTHPRINTS
Get important information for both clinicians and parents on this comprehensive site dedicated to child safety. Clinicians can find information on Toothprints, learn how to use the product, watch a multimedia tutorial, review frequently asked questions and download marketing support materials. Parents will discover what to do if their child goes missing, learn tips on safety and precaution and download emergency contact information.

**FEATURED EVENTS & SEMINARS**

- **Soft-Tissue Analysis for Growth & Maturation** by David Sarver
  Birmingham, Alabama, October 9-11, 2003
- **The Dischinger Orthodontic Two-Day Training Camp**
  Lake Oswego, Oregon, October 24-25, 2003
- **Adventures in Orthodontics – Baja Style**
  by Drs. Hilgers, Tracey and Bennett
  Cabo San Lucas, Mexico, November 14-16, 2003
- **The Gorman Institute**
  New Orleans, Louisiana, February 12-14, 2004

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Dr. Jim McNamara – Class II Correction
Ms. Char Eash – Positive Team Communication

DOCTOR PROGRAM
Drs. Craig Andreiko, Jim Hilgers, David Sarver and Steve Tracey – The Benefits of a Patient-Specific Appliance System

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Management of the Developing Class III Malocclusion

WITH FACEMASK THERAPY AND PALATAL EXPANSION

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Class III malocclusions continue to be the most challenging to accurately diagnose and clinically manage. Unfortunately, with adults, orthognathic surgery and dental camouflage remain our only viable treatment options. However, a variety of treatment alternatives exists for patients in the developing stages of a Class III malocclusion. In the past much of the therapy has focused on restriction of mandibular growth with chin cups and functional appliances. This is based on the traditional thought that developing Class III malocclusions were the result of a prognathic mandible. Recently, however, there has been a growing awareness that the majority of patients with a developing Class III skeletal pattern exhibit a maxillary deficiency with a normal or only slightly prognathic mandible. Therefore, considerable attention has lately been given to early treatment using maxillary protraction therapy. In this article we will demonstrate why using facemask therapy in conjunction with maxillary expansion has been shown in clinical reports to be a successful and predictable treatment option. In addition, we will discuss which patients are best suited for this type of therapy as well as our treatment protocol.

Correction using facemasks with palatal expansion occurs by a combination of skeletal and dental changes in both sagittal and vertical dimensions. These changes occur as a result of forward movement of the maxilla, backward and downward rotation of the mandible, and proclination of the maxillary incisors. Consequently, we will discuss which patients are best suited for this type of therapy as well as our treatment protocol.

A wide variety of clinical results using this treatment can be found in the literature, with more recent investigators reporting average maxillary advancement of 3.3 mm, with some patients ranging from 5 to 8 mm, and average SNA change of 2.35°, with some patients showing 4° to 5° change. Moreover, anterior maxillary tooth movement and mandibular clockwise rotation each accounted for 25% of total correction. Other dentofacial changes contributing to Class III correction shown to occur with facemask and palatal expansion treatment are downward movement and counterclockwise rotation of the maxilla, increased convexity in the midface with forward displacement of the maxilla.
orbitale and key ridge, increase in maxillary depth and lower facial height, anterior movement of maxillary molars and incisors, decrease in SNB, as well as inferior movement of B-point, pogonion and menton. Soft-tissue changes contributing to increased convexity of the profile are anterior movement of pronasale, subnasale, and labrale superius, as well as inferior movement of the soft-tissue chin. When comparing the contribution of orthopedic and orthodontic effects with facemask and palatal expansion therapy, nearly all investigators attribute the majority of Class III correction to orthopedic movement, with most of the change taking place in the maxilla.

Accurate Diagnosis Is Key
The skeletal and dental changes in anteroposterior and vertical dimension that occur with this treatment are well suited for patients that present with deep overbite, sagittal and vertical maxillary deficiency, and normal to mildly prognathic mandibles. In the literature, developing Class III patients ranging from 4 to 14 years of age treated with facemask and palatal expansion therapy have been examined. Some investigators have not found statistically significant differences in skeletal response between various age groups. However, several clinical reports have shown superior treatment outcomes in younger children with early mixed dentition. These children were shown to have an enhanced potential for orthopedic correction with significantly greater increase in SNA angle and advancement of the maxilla, increased molar and overjet correction, and less mandibular clockwise rotation. Furthermore, the treatment results were obtained faster and with fewer hours of daily appliance wear. In practice, we have found that patients in the mixed dentition, typically age seven or eight (depending on dental development), with the permanent incisors and first molars in the maxillary arch fully erupted respond most favorably (Figures 1a-g). Regardless of whether or not a patient has an initial transverse discrepancy, both facemask and palatal expansion therapy are used. Opening the palatal suture complex allows the maxilla to be advanced more easily by the facemask and serve as an anchor for the orthopedic forces.

While success is possible in patients younger than age seven, cooperation typically is diminished because these appliances are more difficult for very young patients to manage. Prior to that age we continue to observe their development and sometimes initiate treatment with a removable appliance in the maxillary arch to correct dental anterior crossbites. Some studies indicate that older developing children demonstrate some orthopedic changes and beneficial dental correction. Our usual protocol is to treat patients in the late mixed dentition, while growth is still possible, to help avoid the need for surgery.

Treatment Time
Ideal treatment time varies markedly in clinical reports. A range of 6 to 18 months of active treatment time has been reported. Following the completion of facemask therapy, patients tend to continue growth patterns similar to untreated Class III controls, characterized mainly by deficient maxillary growth. Mandibular growth in these patients, however, is similar to Class I controls. As a result, overcorrection of maxillary protraction during treatment is a key to long-term stability, because deficient posttreatment maxillary growth in these patients is to be expected. With overcorrection, most patients demonstrate sufficient stability and do not require additional facemask therapy in the second stage of treatment. However, there are some patients who require continued maxillary protraction even during Phase II treatment. In a study where at the end of a four-year observation period and after half of the patients completed their pubertal growth spurt, 75%
of patients maintained positive overjet or an end-to-end incisal relationship. Patients who reverted to a negative overjet after treatment were shown to have excess horizontal mandibular growth.11

Appliance Design – Facemask

The key to successful treatment using facemask and palatal expansion therapy is patient compliance. Many maxillary protraction appliances are uncomfortable to wear and difficult for patients to adjust. This leads to less than ideal results because the patient cannot easily adhere to the at-home management of the appliance.

We have found that Ormco’s Adjustable Dynamic Protraction Facemask offers a significantly more manageable approach. Compared with other facemask designs, the AD Protraction Facemask is more comfortable, especially for very young children. The forehead rest and chin cup are much smaller and adapt more accurately to the patient’s anatomy (Figures 2a-d). The entire appliance is also fully adjustable.

With comfort and ease of appliance use being vital to treatment success, the most significant benefit to this unique design is the dynamic range of movement it allows the patient (Figures 2a-b). The patients’ ability to comfortably open and close their mouths without restriction contributes greatly to patient compliance, which translates into extra hours of appliance wear and gives the clinician efficient adjustment visits.

Appliance Design – Palatal Expansion

Conventional palatal expansion appliance designs provide palatal expansion and sutural opening with closely adapted labial arms that extend to the canine region as an attachment for elastic traction. Our experience with this design has been that the labial extensions can easily become dislodged or distorted due to the orthopedic elastic forces. In addition, as the maxillary dentition is brought forward, there is a possibility of impacting maxillary permanent canines that may initially be in a compromised position.

Considering these factors, we use a new design that has been modified to maintain the arch circumference and provide a more reliable connection of the labial extensions (Figures 4a-b). Also, the labial extensions are now soldered into the headgear tube for increased rigidity. It is important to attach the extensions in a way that ensures unimpeded access to the working buccal tube. When there is a significant vertical component to the malocclusion (evidenced by a hyperdivergent growth pattern and high mandibular plane angle), we use a bonded variety of expander to aid in controlling the vertical dimension.

As mentioned, palatal expansion is advocated as an integral part of this treatment modality even in the absence of an initial transverse discrepancy. When the palatal vault is narrow, we benefit by correction of the posterior crossbite. In all patients, we gain an increase in arch length (maxillary crowding is common in these patients), loosening and activation of circummaxillary sutures, and initiation of downward and forward movement of the maxillary complex.

Treatment Protocol

Maxillary expansion is initiated two weeks prior to starting facemask therapy. It is important to allow time for the patient to acclimate to the expansion appliance prior to beginning facemask treatment. One turn every fourth day is our typical protocol. The goal is to activate the maxillary complex for protraction without significantly altering the transverse dimension. At the start of facemask therapy, we evaluate the amount of expansion accomplished thus far and decide how much
is still needed. If no initial transverse discrepancy exists, then one turn per week is used for approximately two months and gradually reduced thereafter. If an initial transverse discrepancy does exist, we begin with the same protocol as outlined previously, and the subsequent amount of expansion needed dictates the prescribed turns per week. We do not want to achieve transverse correction prior to starting facemask treatment because constant disarticulation of circummaxillary sutures is preferred for successful maxillary protraction. Expansion should be discontinued prior to buccal crossbite of the posterior dentition. With proper oral hygiene, ideally the expander will remain in the mouth for six months. At that point, molar bands are substituted and elastic traction is continued by connecting elastics to hooks on the maxillary first molar bands.

Facemask treatment protocol depends upon the age at which we initiate treatment. We take a similar approach to determining the elastic forces used with facemask therapy as we did with our initiation of palatal expansion, recognizing how important it is to allow a patient time to adjust to wearing any new appliance. Starting with light training elastics in the range of 6 to 8 ounces (170 to 230 grams) allows the patient to become accustomed to the treatment and therefore more compliant. The goal is to reach orthopedic force levels of approximately 14 ounces (400 grams) per side within a few weeks.

Our instructions are for home use of the facemask, which includes overnight wear and at least four additional hours per day. When therapy starts at an early interceptive stage in the transitional dentition, facemask therapy is usually carried out for approximately 18 months. This is followed by a resting phase, using a removable retainer to provide active anterior protraction of the maxillary dentition and retention of the orthopedic correction gained by maxillary advancement.

Upon completion of both facemask and palatal expansion treatment, the patient is kept under observation to monitor mandibular growth and eruption of the permanent dentition. An evaluation for a second phase of treatment with full fixed appliances is usually indicated.

**Management of the Dentition During Facemask Treatment**

During this type of treatment, maxillary anterior teeth are leveled and aligned using the Orthos®* Differential Slot-Size System of mechanotherapy, which incorporates .018 brackets on central and lateral incisors and .022 brackets on canines and premolars.18

The aligned maxillary incisors are properly positioned with a stainless steel archwire and subsequently with an advancement arch to create appropriate overbite and overjet. Typically, placement of mandibular fixed appliances is delayed during this stage of treatment in order to avoid undesired labial movement of mandibular anterior teeth. The timing of full fixed appliance therapy is based on eruption of the permanent dentition. Mandibular appliances in the adult dentition allow for the use of Class III interarch mechanics and the establishment of ideal occlusion.

**Conclusion**

Facemask and palatal expansion therapy is considered to be an effective and predictable approach to treatment of the developing Class III malocclusion and is supported in the literature. Proper diagnosis and use of the appliances and mechanics previously described will ensure that you obtain the long-term results you desire. The following case study (pages 18-19) further illustrates the type of therapy discussed. 4

References can be found on page 21.

* Distributed in Europe as Ortho-CIS.
**CASE STUDY**

**PRETREATMENT RECORDS**

Patient NG prior to treatment at age 8 years 10 months. Cephalometric radiograph indicates a Class III skeletal pattern with a retrognathic maxilla and mild mandibular prognathism. Facial photographs show a straight profile.

Patient exhibits a Class III skeletal malocclusion with a transverse discrepancy, mandibular shift to the right and mandibular midline deviated 4 mm to the right.

Treatment plan: Fixed palatal expander followed by AD Protraction Facemask and limited fixed appliances using the Orthos Differential Slot-Size System.

**10-MONTH PROGRESS PHOTOGRAPHS**

Orthos .018 maxillary anterior brackets were used with an .018 stainless steel advancement arch. Anteriors were initially leveled and aligned with .016 27°C Copper Ni-Ti® followed by .017 x .025 35°C Copper Ni-Ti. Continued Facemask therapy significantly improved the patient’s profile aesthetics.

**20-MONTH PROGRESS PHOTOGRAPHS**

Eruption of the permanent canines and premolars had begun. Positive overbite and overjet were maintained with .018 x .022 stainless steel arch. No mandibular appliances were placed. Facemask therapy was continued but reduced to nighttime wear only.

**42-MONTH FINAL PHOTOGRAPHS**

Eruption of the permanent canines and premolars continued. Positive overbite and overjet were maintained. Ready to initiate the second phase of treatment with fixed appliances to establish ideal occlusion. The cephalometric radiograph indicates positive skeletal changes. The panoramic radiograph shows an excellent eruptive pattern.
Getting the Perfect Facemask Fit

PATIENT COMFORT MEANS PATIENT COMPLIANCE

Fernando Morales, DDS
Mexico City, Mexico

After many years of treating Class III cases with various facemask designs, I felt there were improvements that could be made, particularly in the area of patient comfort. As a result, I developed the AD (Adjustable Dynamic) Protraction Facemask. It features a small forehead rest and chin cup yet still provides adequate mainframe support. The horizontal crossbar can be adjusted vertically to change the angle of elastic force delivery and can be placed on the facial side of the mainframe or the outer side, which changes the force exerted on the maxilla by 10 mm. The vertical mainframe is constructed from a rectangular stainless steel bar, rigid enough to support even the heaviest elastics. Most importantly, the AD Protraction Facemask is dynamic in design. Both the forehead rest and chin cup slide freely along the vertical mainframe, allowing patients to open and close their mouths without restriction.

Getting patients to comply with any form of appliance therapy can be difficult, but it is especially challenging when the appliance is uncomfortable to wear and restricts normal movement. The AD Protraction Facemask is designed for full adjustability to accommodate patients of all shapes and sizes. In the end, this adjustability provides the patient with increased comfort, and increased comfort fosters greater patient compliance.

Following are tips and techniques to help get the perfect facemask fit for all Class III patients.

Choosing the Right Design
Due to variations in facial structure, it is important to choose the facemask design that will provide the most accurate and comfortable fit. Most patients’ chins are triangular and slightly acute in shape. The design that best accommodates this facial structure is the original AD Protraction Facemask, which has increased curvature in both the forehead rest and chin cup (Figure 1a). Some patients, however, have a more-than-ample facial structure, with wide foreheads and flat-shaped chins. For this reason, I developed the Asian Profile Protraction Facemask, which has a slightly larger forehead rest and a smaller, more-shallow chin cup (Figure 1b).

Accurate Forehead Adaptation
When initially fitting either facemask to a patient, there are two things to watch for in the forehead area: (1) too much pressure on the outer ends of the pad and (2) forward rotation of the forehead rest when the patient opens his/her mouth. Because of differences in facial structure, it is important to be sure that the forehead rest and pad accurately match the curvature of the patient’s forehead. If it does not, your patient may end up with concentrated pressure on the outer ends of the forehead pad. Since the AD Protracation Facemask has a little more forehead curvature, you may need to adjust it by applying a small amount of force on both ends of the forehead rest to lessen the curvature. Repeat if necessary (Figures 2a-b).

If a facemask is not adjusted properly, the forehead rest can rotate forward when patients open their mouths. This typically happens when the distance between the forehead rest and the upper stop of the chin cup support is too short. To correct this, move the upper chin cup stop slightly lower on the vertical mainframe. This will help improve the stability of the forehead rest.
Comfortable Chin Fit
Another common problem with any facemask is the fit to the patient’s chin. If pressure around the chin cup is not distributed uniformly, the patient can develop tissue lesions and/or periodontal problems. The AD Protraction Facemask now comes with an improved chin cup pad that covers the edges of the chin cup to help avoid direct pressure on the patient’s soft tissue (Figures 3a-b). If the pressure still exists, adjustments can be made to correct the problem. First, make sure you have selected the type of facemask that is best suited to the patient’s anatomy. Second, try changing the chin cup position (up or down) to relieve the pressure (Figures 4a-b).

Achieving Facemask Stability
Facial balance is also important because it allows an equal elastic force on both sides of the patient’s maxilla. To ensure balance, position the elastics in the same groove on both sides of the horizontal crossbar. If an asymmetry still exists, try crossing the elastics to their opposite side on the crossbar.

Conclusion
While maxillary protraction therapy has been used for many years, traditional facemask designs did not provide the level of patient comfort necessary to encourage patient compliance. As a result, treatment results were compromised. The AD Protraction Facemask and the Asian Profile Protraction Facemask were designed strictly with patient comfort and compliance in mind. Because both designs are fully adjustable, they can be adapted to the anatomy and needs of each of your Class III patients in order to get the perfect fit.

REFERENCES TO MANAGEMENT OF THE DEVELOPING CLASS III MALOCCLUSION, PAGES 14-19.

*Past issues of Clinical Impressions can be found at ormco.com/ci.
As people all over the world are putting greater emphasis on self-improvement, and with recent advances in orthodontic technology and aesthetic materials, more adults are seeking orthodontic treatment. In fact, out of the 1.3 million people who begin orthodontic treatment each year, around 25% are over 18 years old.¹ As a result, orthodontists are faced with the challenge of bonding to porcelain restorations (crowns, veneers) (Figure 1). This has presented quite a challenge in the past, but using the proper materials and following the necessary procedure can ensure a reliable bond.

Essentially, there are two viable options when bonding to porcelain: (1) bond it mechanically by etching the porcelain with hydrofluoric acid or (2) bond it chemically using a silane coupling agent. The disadvantages of a hydrofluoric acid etch are that it involves using a potentially dangerous acid and it creates a porous, roughened surface in the porcelain, much like etched enamel.

While you can obtain an excellent bond to etched porcelain, this process removes the outer glaze, which is extremely difficult to regain after treatment. For this reason, I recommend using a silane coupling agent to obtain a chemical bond. This involves following a meticulous procedure; however, it is a much safer method and provides bond strengths comparable to a hydrofluoric acid-etched surface without destroying the porcelain glaze (see Literature Review).

In dentistry, silane coupling agents are provided in the form of porcelain primers. There are various types of porcelain primers on the market today, each consisting of a different chemistry. Ormco’s Porcelain Primer consists of ethanol and a silane coupling agent, which chemically unites the silicon in the porcelain to the acrylic bonding material used. Because using a porcelain primer involves meticulously following a specific procedure, I am providing this procedure in detail in the following text, as well as other information I have found useful.

Instructions*
1. Obtain isolation and saliva control for the porcelain crown to be bonded.
2. Apply a liquid phosphoric acid solution to the glazed porcelain surface (Figure 2). (Because the acid must react with the silane in the Porcelain Primer at the surface of the porcelain, it is important to use a liquid solution rather than a gel. The gel form prevents Porcelain Primer from reaching and reacting with the porcelain surface.) Once applied, the phosphoric acid will clean (remove any biofilm present) and acidify the surface. Do not rinse off the acid! The acid solution must remain on the porcelain surface in order to react with the Porcelain Primer.
3. In the presence of the acid, apply the Porcelain Primer solution to the porcelain surface using a fresh cotton pellet (Figure 3). The Primer may be applied immediately after the phosphoric acid solution. Apply a second coating of Porcelain Primer with another

Dr. Michael L. Swartz has spent more than 38 years in the dental field as a dental technician, dental materials research chemist, general practitioner, director of research and development at Ormco, practicing orthodontist and worldwide lecturer. He has been instrumental in the development of composite restorative materials, pit and fissure sealants, enamel bonding and orthodontic bonding applications. After earning his D.D.S. from the University of Southern California School of Dentistry, Dr. Swartz maintained a private, general dental practice and served as the director of research and development at Ormco. Later he returned to school at the University of California, San Francisco to obtain his postdoctorate orthodontic certificate and then opened a private practice in Encino, California. Dr. Swartz is currently director of clinical affairs at Ormco, conducting numerous continuing education programs. He has given over 400 presentations around the world and been published extensively in both clinical and research journals.
fresh cotton pellet. Leave the combined solution of acid and Primer undisturbed on the porcelain surface for one minute. Note: Porcelain Primer has a one-year shelf life. Do not use after the expiration date because the material can polymerize over time and become ineffective. Keep the bottle tightly capped when not in use.

4. After one minute, thoroughly rinse and dry the porcelain surface (Figure 4). Maintain isolation and saliva control.

5. The porcelain surface has now been coated with a mono-molecular layer of acrylic that can be bonded with any orthodontic bonding resin. First apply the sealant/primer to the prepared porcelain crown and then apply the bracket and bonding paste (all according to the manufacturer’s instructions) (Figure 5).

Debonding Considerations
Care must be taken when removing bonded attachments from porcelain. Porcelain is a brittle material and the chemical bond strengths obtained with Porcelain Primer can be very high. When debonding metal and plastic brackets, the best method to use is a peel-type force, which is applied by distorting the bracket. With a twin-type bracket, gently squeeze the bracket wings together with a plier. This will separate the bracket from the adhesive underneath, leaving an adhesive layer on the porcelain crown, which is then removed with a finishing bur, sanding discs and polishing cups.

Take additional care when removing a ceramic bracket that has been bonded to porcelain. If the force necessary to debond a ceramic bracket is high, it can cause a fracture in the porcelain crown or veneer. To avoid stressing the porcelain, I recommend grinding down the ceramic bracket with a diamond bur and then polishing any remaining bonding material.

Conclusion
As more adults seek orthodontic treatment, we are often faced with the challenge of bonding to porcelain crowns and veneers. Though this requires following a detailed procedure and using both safe and effective bonding materials, the result is a reliable bond that does not compromise the integrity of the porcelain surface.

A Review of the Literature
An in-vitro study comparing bond strengths of glazed and unglazed porcelain samples found no statistical difference in the bond strengths between the glazed and unglazed specimens when bonding with System 1®+ and Porcelain Primer (Ormco).

Another study measured the shear/peel bond strength (using a silane primer) to 100 glazed and 100 stone-ground porcelain specimens. Bond strengths were the same or greater with glazed surfaces but the incidence of porcelain fractures were greater with deglazed samples (71% vs. 36%).

In 1996, Zachrisson reported on laboratory bond strengths to porcelain. The specimens were sandblasted and then treated with either a silane coupling agent (i.e., Porcelain Primer) or etched with hydrofluoric acid. The sandblasted and silane-treated samples had a mean bond strength of 11.6 MPa (S.D. 2.9) and the sandblasted and hydrofluoric acid-etched samples had a mean of 11.5 MPa (S.D. 2.8). The conclusion stated that there was no significant difference in bond strength between the two.

More recently, an in-vitro study compared porcelain samples that were sandblasted and silane treated, silane treated only, etched with hydrofluoric acid or combined hydrofluoric acid etch with silane treatment. They concluded that “...the bond strengths for silane alone and for silane with sandblasting were not statistically different....The use of silanes without mechanically removing the glaze from the porcelain surface results in the least damage to the porcelain and still demonstrates acceptable bond strengths.... Clinically, the method of choice will probably be the one that provides a sufficient bond without having to roughen the porcelain surface.”

REFERENCES:

*Instructions provided in this article are for porcelain bonding using Ormco’s Porcelain Primer only. When using another material, please refer to the individual manufacturer’s instructions.

SCENE IN CI
Video supplement to this article is available online at www.ormco.com/ci.
Patient MH (age 29 years 3 months) presents with a bilateral crossbite, Class I molars left, Class III molars right, midline discrepancy, 8 mm overjet and arch length discrepancy in both arches. Patient was advised of the need for surgery, but she declined. Full pretreatment records can be seen on pages 2-3.

Treatment Plan: Rapid palatal expansion followed by max. right 1st bicuspid extraction, fixed appliances and finishing elastics, using the Alexander Discipline technique.

RPE was activated with one turn per day (unless too much discomfort) for six weeks, then sealed with Enlight® adhesive and left in the mouth for seven months as a transverse space maintainer.

3 MONTHS
Two months after sealing the RPE, the mandibular arch was bonded and banded and an .017 x .025 35ºC Copper Ni-Ti® archwire was inserted. Seven months after sealing the RPE, the appliance was removed and the maxillary right 1st bicuspid was extracted.

At eight months into treatment, the maxillary arch was bonded and banded. An .016 NiTi® wire was used in the maxillary arch and an .017 x .025 TMA® was used in the mandibular arch. At nine months, retraction was begun on the maxillary right cuspid, using power chain on an .016 stainless steel archwire. The .017 x .025 stainless steel finishing archwire was placed in the mandibular arch at 12 months.

14 MONTHS
An .018 x .025 closing loop was placed in the maxillary arch. To begin correcting the midline, patient was instructed to wear a Class II elastic only on the right side.

At 20 months into treatment, the finishing archwire (.017 x .025 stainless steel) was placed in the maxillary arch.

25 MONTHS
At 25 months, the patient was instructed to wear finishing elastics (Ormco’s Ostrich, ¾ in., 2 oz.) on both sides 24 hours a day for the next 4 wks.

POSTTREATMENT
After 26 months, appliances were removed and the patient was given a removable wraparound retainer (Ormco’s Wick™ Flat Bow Retainer) for the max. arch to retain the final arch form and allow the posterior occlusion to continue to improve over time. Instructions were for nighttime use only. An .0215 Triple Flex™ wire was bonded on the mand. arch 3x3. To achieve good buccal occlusion, it was necessary to rotate the max. right molar distobuccally since it was finished in a Class II molar relationship. Some gingival recession occurred but has been healthy and stable since the completion of treatment.

This patient was treated at the office of Drs. Wick and J. Moody Alexander.
Dr. R.G. “Wick” Alexander is a clinical professor of orthodontics at Baylor College of Dentistry in Dallas, Texas and the University of Texas Dental Branch in Houston. He developed The Alexander Discipline bracket system and treatment technique, and he teaches The Discipline throughout the world. He has also written a book and has published many research and clinical papers. American Board certified, Dr. Alexander has served as a trustee to the A.A.O. and president of both the Texas Tweed Group and Southwest Angle Society. His professional awards from the A.A.O. include the Milo Helman Research Award and Dewel Clinical Award. In addition to his traveling and teaching, he continues to practice with his son, Moody, in Arlington, Texas. Wick and his wife, Janna, have three children and nine grandchildren. Their son, Dr. Chuck Alexander, practices orthodontics in Montrose, Colorado, and their daughter, Shanna, is married to Luis Argote, general manager of the Four Seasons Hotel and Resort in Costa Rica.
Multifunctional Herbst Solutions

Paula Allen-Noble
Mandeville, Louisiana

The Herbst* not only reigns as the functional appliance of choice for Class II correction, it is also available in a myriad of designs (both standard and custom) that can accommodate different mechanisms and attachments to achieve multifunctional treatment goals (e.g., Class II correction along with upper and/or lower arch expansion, space opening or closure, or high-angle open-bite intrusion). The following article describes designs and typical guidelines for two of those goals: space closing and intrusion.

**Space Closing**

Space-closing Herbsts are used bilaterally or unilaterally in the upper and/or lower arches to protract 1st permanent molars when 2nd bicuspids are missing. These appliances provide anchorage to hold the incisors in place, allowing molar protraction and Class II correction simultaneously without distalizing the incisors. This treatment includes fixed appliances on the anterior teeth.

- **The Sliding Space-Closing Herbst** uses Ni-Ti® springs, thread or chain in conjunction with a lingual arch (soldered to 1st bicuspid crowns) that connects to the molar bands through tubes, and typically achieves 3 mm of space closure in about 7-8 weeks. Until total space closure is achieved (7-12 months for lower arch; faster for upper), the patient is usually seen every 6-7 weeks and monitored to ensure that the end of the lingual arch does not impinge on the gingival tissue. After space closure, the patient can be seen at longer intervals until Class II correction is complete.

- **The Space-Closing Herbst with Screws** uses screw(s) connected to 1st bicuspid(s) and molar(s) to close space, which usually takes 8-10 weeks. The patient typically turns the screw 1/4 turn every day or every other day. Since the maximum space closure with this design is 9 mm, a second Space-Closing Herbst may be needed if the space to be closed is more than 9 mm. In this case, the first appliance is removed and two sets of impressions are taken, one for the second appliance and one for a full-arch invisible retainer, which should be delivered immediately to retain the achieved space closure. An alternative to using a second appliance would be to request hooks on the buccal of the 1st molar band(s) and 1st bicuspid crown(s) on the initial appliance to accommodate Ni-Ti springs, thread or chain. In this case the closed screw(s) would need to be cut off of the anchoring bands/crowns to allow complete space closure.

**Intrusion**

Intrusion Herbsts are used as anchorage to correct Class II high-angle open-bite cases in mixed or permanent dentition through impaction of the upper posterior teeth and repositioning of the mandible. Intrusion usually occurs in 3-5 months (2nd permanent molar intrusion takes another 3-5 months), with an additional 3-8 months for Class II correction. This treatment includes fixed appliances on the anterior teeth.

- **Upper Appliance** – The upper intrusion part of the appliance is offered in various designs to accommodate a patient’s current dentition. It consists of crowns on either the 2nd primary molars or 1st permanent bicuspids. It also includes occlusal stops for

*Herbst is a registered trademark of Dentaurum, Inc.
stability, .036 stainless steel intrusion wires with helix loops (to be activated 90° prior to insertion) and cantilever extensions (with .022 archwire tubes) for placing Herbst axles in the appropriate position, depending on the dentition present during the intrusion treatment phase. Crowns are placed on the 1st permanent molars to be intruded. If 2nd permanent molars need to be intruded, crowns will not be placed on the 1st permanent molars. The intruded 1st molars will be held in place with an occlusal holding stop on the 2nd intrusion appliance. (Important: Crowns modified with an occlusal opening, Herbst axle and .022 archwire tube must be cemented on the 2nd molars to be intruded before cementing the intrusion part of the appliance.)

**Lower Appliance** – In contrast to a standard cantilever Herbst, the lower cantilever arms of the Intrusion Herbst are offset low and gingivally to produce more vertical force. This helps prevent extrusion of upper primary molars and holds the upper arch in place during intrusion. Occlusal stops that extend from the cantilever onto the occlusal surface of the primary 1st molars or 1st bicuspids prevent the cantilevers from tipping down the vestibule toward the teeth, while occlusal stops from the crowns on the anchoring molars ensure molar stability. The lower appliance remains in place with the Herbst mechanism engaged during both intrusion and Class II correction.

**Mixed Dentition** – Once the upper 1st permanent molars are intruded, the intrusion part of the appliance is removed, the Herbst mechanism is engaged to the axles on the intruded upper 1st permanent molars and the upper 1st and 2nd primary molars are extracted.

**Permanent Dentition** – Treatment may require a second appliance to intrude the upper 2nd permanent molars (both appliances can be made simultaneously).

After molar intrusion (mixed or permanent), the intrusion part of the appliance is removed and the upper Herbst mechanism is transferred to the axles on the crowns of the intruded 1st (or 2nd) permanent molars for Class II correction. The intruded molars are held in place using Triad or composite buildup on the occlusal surface, which stabilizes the molars until the remaining upper posterior teeth are intruded and leveled with fixed appliances in a specific and timely sequence. Once intrusion is complete, the adhesive buildup is removed to allow the mandible to auto-rotate closed. The smile line is evaluated, incisors are intruded, if necessary, and the mandible is set to the maxilla.

For more information on clinical management of the Intrusion Herbst, call AOA to request a copy of Dr. Terry Dischinger’s Open-Bite Intrusion Herbst article [from AOA Appliances, etc., Vol. 5, No. 2, 2001] or visit www.aoa-pro.com, where you’ll also find our Herbst manual.

**Conclusion**

Clinicians are becoming more comfortable with Herbst therapy and are modifying the appliance for multifunctional purposes to meet their patients’ specific treatment goals. AOA’s technical teams are uniquely qualified to assist you and your office with those goals and will further support your practice with up-to-date literature and information.

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**With a myriad of choices, AOA has your Herbst solution.**

**Flip-Lock Herbst** (TP Orthodontics) – With enhanced flexibility of jaw movement, this low-profile design with simplified C-Spacer activation allows advancement without disassembling.

**Hanks Telescoping Herbst** (American Orthodontics) – This single-unit mechanism with C-Spacer activation allows a wide range of lateral movement and won’t disconnect during the most extreme opening.

**Hex Screw Herbst** (Ormco) – Still the workhorse of Herbst mechanisms, this style features the 5.5 mm protective lower screw head.

**AOA Cantilever Arm** – Unique proprietary material offers maximum durability and a slim buccal profile.

AOA’s technical support teams are available to discuss various design options: Dave Nelson, Sturtevant, Wisconsin (800-262-5221), and Ron Nilsen, Enfield, Connecticut (800-826-2224). Paula Allen-Noble, AOA’s clinical liaison, is available to discuss clinical management (800-990-3485 or 985-727-2985).

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Intrusion Herbst for permanent dentition – 1st appliance.

Intrusion Herbst for permanent dentition – 2nd appliance.
Maximize the Benefits of the Damon System with New Optimal-Force Archwires

The key to realizing the full potential of the Damon System is combining the unique characteristics of the passive Damon 2 appliance with archwires that deliver optimal forces through each phase of treatment. Ormco introduces two new specialty archwires that enable clinicians to deliver those ideal forces consistently and predictably for each patient: Damon Optimal-Force Copper Ni-Ti® and Damon Low-Friction TMA®.

Damon Optimal-Force Copper Ni-Ti
Since its introduction into the orthodontic market in 1993, Ormco’s Copper Ni-Ti archwires have become some of the most popular archwires today. Adding copper to nickel titanium (as only Ormco has the proprietary license to do) allows the archwire to be manufactured with far greater precision and consistency, giving it the reliability and superelasticity desired. Copper Ni-Ti archwires generate a more constant force over longer activation periods with only a small difference between the loading and unloading (tooth-moving) forces, which translates into consistent and predictable tooth movement. Copper Ni-Ti is also more flexible than traditional Ni-Ti archwires, exhibits better spring-back characteristics, and is more resistant to permanent deformation.

Now those same benefits are available in an archwire that suits the particular needs of the Damon System. Damon Optimal-Force Copper Ni-Ti combines the properties of Copper Ni-Ti wire with a slight increase in loading and unloading force, a deeper dimension of .025” to provide added control and the patented Damon arch form.

Damon Low-Friction TMA
Twenty-two years ago Ormco developed the original beta titanium archwire. Over the years, we’ve refined the manufacturing process in order to provide the largest variety of TMA wires and sizes available. Today our TMA remains the industry standard for consistency and quality. With half the stiffness and twice the working range of stainless steel, TMA delivers gentler, more optimal force to the tooth, makes bending the wire much easier and maintains those bends more consistently through treatment. With an exclusive ion beam implantation process that further hardens the surface of the alloy, we’ve also introduced a variety of TMA that is extremely low in friction and provides sliding mechanics comparable to stainless steel. Damon Low-Friction TMA and Damon Low-Friction Colored TMA (purple and honeydew) incorporate all the benefits of Low-Friction TMA with the patented Damon arch form and sizes that complement the Damon System of passive self-ligation.

New Debonding Plier for the Damon System
Ormco introduces a new debonding plier specifically designed for removing Damon 2 brackets. The Damon Debonding Plier is a modified metal debonding plier with customized tips that fit under the occlusal and gingival tie-wings of a Damon 2 bracket. After placing the tips correctly, slowly squeezing the instrument handles together removes the bracket from the tooth comfortably and safely.

Ormco Debonding Plier Part No. 866-4008
Titanium Orthos2 Buccal Tubes

Everything you’ve always wanted in a molar bond...reliability.

Titanium Orthos®2 Buccal Tubes combine the bond strength and biocompatibility benefits of titanium with a revolutionary new design to give you a molar bond you can actually count on. They have a teardrop design on the lower arch to help keep them out of occlusion and a funneled slot opening that makes archwire engagement easy without adding extra dimension to interfere with occlusion. A notch on the occlusal edge makes holding the buccal tube a cinch and aids initial placement on the tooth. No tie-wings and a hook that tilts away from the gingiva also make it comfortable for patients to wear. It’s the first Ormco buccal tube to feature an I.D. dot and is compatible with the Orthos system. And, we put it on the largest pad available to add surface area and increase bond strength. Titanium Orthos2 buccal tubes are available in .018 and .022 slot sizes in the original Orthos prescription.

LARGER BONDING SURFACE – We’ve dramatically increased the surface area on the Titanium Orthos2 buccal tube by incorporating the largest pad available for improved bond strength and a better fit to the tooth.

HANDLING NOTCH – A unique notch on the occlusal side makes holding the buccal tube a cinch and helps with initial placement on the tooth.

TEARDROP DESIGN – Buccal tubes on the lower arch feature a teardrop design to keep them out of occlusion. There are also no tie-wings to create food traps and inhibit patient comfort.

IN-FACE FUNNELED SLOT OPENING – A patented funneled slot opening that’s built into the tube’s dimensions makes archwire engagement easy without adding extra dimension to interfere with occlusion.

COMFORTABLE HOOK DESIGN – Titanium Orthos2 buccal tubes feature the Ormco hook design, which tilts away from the gingiva to avoid impingement and enhance patient comfort.

I.D. SYSTEM – The Titanium Orthos2 buccal tube is the first Ormco buccal tube to feature an I.D. dot and it’s compatible with the legendary Orthos system.

Pliers to fit every Herbst need...

Advances and variety in design as well as increased use of noncompliance therapies have made the Herbst* appliance one of the most widely used functional appliances in the correction of skeletal and dental Class II malocclusions. Whether you’re just getting started with Herbst therapy or you’ve used the appliance for years, it’s important that you have the necessary instruments on hand when you need them.

Crowns are still the preferred method for most Herbst appliances, but their strength and rigidity can make them difficult to fit at the beginning of treatment as well as remove upon completion. Ormco’s ETM® Crown Contouring Plier is designed to add increased curvature to a stainless steel crown in order to ensure that it fits securely on the patient’s tooth. The AEZ® Chastant** Crown Removing Plier (used in conjunction with an inverted cone bur that cuts an occlusal window in the crown) has opposing beaks that grasp the occlusal and lingual surfaces of a crown and lift it off the tooth. The AEZ Crown Slitting Plier uses a padded tip to grab the occlusal surface of a crown and a hooked beak that slits the crown up the side, thus allowing for easy removal.

1 - ETM Crown Contouring Plier Part No. 800-0160
2 - AEZ Chastant Crown Removing Plier Part No. 803-0610
3 - AEZ Crown Slitting Plier Part No. 803-0430

*Herbst is a registered trademark of Dentaurum, Inc.
**Designed by Dr. Robert B. Chastant

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*Orthos is distributed in Europe as Ortho-CIS.
**Big Power in a Convenient Package**

Introducing the L.E.Demetron I. The first name in curing lights combines the latest technology with concentrated power and convenient portability for the highest level of performance ever in an LED light.

- **Cordless Portability** – Provides the ultimate in convenience.
- **10-Second Cure** – Generates power comparable to the Optilux 501.
- **No Downtime** – Includes sleep mode, battery gauge, low-battery signal and 2 battery packs for maximum productivity.
- **11 mm and 8 mm Turbo Light Guides** – Two options for varied techniques.
- **Built-In Radiometer** – Ensures accurate power intensity.
- **Unique Diode Array** – Patented array emits a higher output than any other LED.
- **Quiet Internal Fan** – Cools down the diodes to help the light last longer.
- **Long Battery Life** – Each battery performs 270 ten-second cures before needing to be switched.

There are many LED curing lights on the market. Read the research, ask good questions, compare the options and experience the Demetron difference.

L.E.Demetron I (120v) Part No. 707-0032
L.E.Demetron I (230v - Europe) Part No. 707-0033
L.E.Demetron I (230v - UK) Part No. 707-0034

(Includes handpiece, 11 mm and 8 mm turbo light guides, battery charger, 2 battery packs, auxiliary light stand, wall plug-in transformer, hardness disk and protective light shield.)

---

**In Response to Your Requests...**

Ormco recently added another color to their already popular line of colored Power O’s. **Light Blue Power O’s** are now available in Long Sticks in size .120. They are packaged in bags of 1,000 (20 sticks/50 O’s per stick).

Light Blue Power O’s Part No. 640-0155

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**Toothprints**

**The Dental I.D. System for Safeguarding Children**

Toothprints is a thermoplastic wafer that clinicians can use to record a dental impression. Like fingerprints, dental imprints are unique to every person and can serve as an accurate method of identification in the event that a child gets lost or abducted. Developed by a pediatric dentist as a way of safeguarding his own child and other young patients, Toothprints is a simple, cost-effective way of documenting your young patient’s unique dental characteristics. It takes only a few minutes, but it will give the parents in your practice peace of mind.

Toothprints Dental ID (Contains 25 Toothprints Impression Packs) Part No. 714-0030

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<td>Adelaide, Australia</td>
<td>11/15/03</td>
<td>Alan Bagden</td>
<td>Converting to Passive Self-Ligation</td>
<td>SA ASO, Richard Salmon</td>
<td>61 8 8223 3644</td>
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<td>Ormco Japan; Takashi Kamidai</td>
<td>81 75 561 0411</td>
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<td>Didier Fillion</td>
<td>Lingual Typodont Course*</td>
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<td>Bogomir Yucummi</td>
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<td>385 1 4817679</td>
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The New Paradigm in Appearance-Driven Orthodontic Diagnosis and Treatment Planning

Dr. David Sarver
October 9-11, 2003
Birmingham, AL

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