clinical impressions®

DR. MIKE STEFFEN

DR. STEFFEN | 21ST CENTURY ORTHODONTICS

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editor's NOTEPAD

With the Gorman Institute right around the corner, I've been thinking about this year's theme "Making Your Office the Happiest Place on Earth." Before we learn about creating positive patient experiences from the Disney Institute, think about how your practice communicates with patients and the type of customer service you provide right now. Here's a scenario to ponder.

An Orthodontic Visit from a Mom's Perspective

Mom and child arrive and take a seat. Mom picks up a magazine while the child disappears into the clinic and emerges some time later. They schedule the next appointment and leave. It's an in and out visit, which is convenient, but something is missing.

What happened during this visit? Was it just a checkup? Did the child have something added or removed? When mom asks the child, "What did the doctor do?" she'll usually get a shrug of the shoulders and a standard answer like, "I don't know," or, "Nothing." Meanwhile, she thinks to herself, "Was that visit a waste of time?"

Were any instructions given to the child? *Use wax on that new bracket and take a pain reliever for the next 24 hours . . . wear these elastics except when you eat . . . you need to brush and floss more.* Were the instructions given in writing? Mom would like to know so she can follow-up at home.

What's planned for the next visit? How much longer is the treatment going to last?

Does mom talk to or see the clinical staff during her child's appointment? Is mom just sitting in the waiting room or is she being greeted by the doctor or a staff member in the reception area and given treatment information on her child?

The orthodontic team is treating not only the child but also the family. It may *look* like a waiting room but it *should* be a reception area, a place to report progress and answer questions. These acts of customer care show mom that the doctor and staff are sincerely interested in creating a positive orthodontic experience for the family.

Jan DeCarlo, *CI* Editor

twenty-first century orthodontics

J. Michael Steffen, DDS, MS
Edmond, Oklahoma

In 1991 I was asked to be a member of the "A" Company Innovation Group (AIG), a group of 12 orthodontists from around the country assembled to brainstorm ideas, evaluate concept products, and determine how they could be driven to the marketplace. It was during this time that Dr. Dwight Damon, a member of AIG, began to crystallize his idea for a self-ligating bracket. He perceived it to be the next evolutionary step in orthodontics to bring bracket technology into line with increasing demand for orthodontic services and the emergence of new *high-tech* wires. The process of tying in archwires had not changed since the inception of the edgewise appliance, and truly half the chair time was used ligating archwires to the brackets. Elastomeric ligatures speeded up the ligation process but caused binding of the wire to the bracket due to friction from the rubber, which slows down physiologic tooth movement. The AIG was the first to clinic the prototypes of the Damon brackets, and what we saw made us excited about things to come. Teeth were aligning rapidly with significantly decreased pain levels, especially when used with light, heat-sensitive wires. Patients were excited and so was I. What Dwight envisioned as a bracket to improve clinical efficiency has actually turned out to be much more.

If the next wire won't allow the bracket slides to close, it means that the patient isn't ready. This self-limiting feature is an excellent tool for determining wire progression.

Today, ten years later, the Damon System 2 is the standard in my practice and the evolution of this remarkable appliance promises to bring us even more options as different tips and torques become available. As we transition from True Roth brackets and Damon SL, there is little that has changed in my treatment protocol. I still use the same archwire sequence, basic mechanics, auxiliaries and space closure. I'd like to share with you some highlights that I think are important in the use of the Damon appliance.

We tell our prospective patients from the beginning that they will have the most technologically advanced brackets and wires available, which will also be more comfortable to wear and will require fewer office visits. This excites both patients and parents.

I have always believed that once you get past the diagnosis, the most critical aspect of the treatment is getting the braces on correctly. You will dramatically save time and effort if the appliances are placed as

Dr. Mike Steffen is a native of the Oklahoma City area where he opened his orthodontic practice in 1974. He maintains a private practice in Edmond with a satellite office in Clinton. Dr. Steffen received his dental degree from the University of Iowa and orthodontic degree from St. Louis University. He holds active memberships in the American Dental Association, American Association of Orthodontists, Oklahoma Dental Association, Oklahoma Society of Orthodontists, Charles H. Tweed Orthodontic Study Group of Texas, Edward H. Angle Society, Progressive Study Club and is a diplomate of the American Board of Orthodontics. He is a three-time recipient of the A. P. Westfall Award from the Texas Tweed Study Group. Dr. Steffen and his wife, Kathy, have three children and two grandchildren. He enjoys golf, weightlifting and bronze sculpting in his spare time.

Figure 1. Loupes with 2 1/2 power magnification ensure greater accuracy when placing Damon brackets, making it much easier to visualize the relationship of the slot to the tooth.

Figure 3. The mouth mirror is a critical tool for checking bracket placement from the occlusal edge.

accurately as possible, and their positions reevaluated at some point during treatment. The old saying "it's hard to straighten teeth with crooked braces" is true. Poor bracket placement is costly in terms of time and materials for you and extra months in treatment for the patient. Also, I recommend that only you, the doctor, place the brackets. No one but you knows more about the anatomy of the teeth and how bracket placement fits into your vision of the final result. Don't delegate this critical task.

Figure 2. The patient's panoramic X-ray is kept chair side for easy referral during the initial bonding.

In placing brackets I use loupes (Figure 1), which give me a much better view of the tooth surface. I have the initial panoramic X-ray (Figure 2) available for quick viewing of root position. The better job I do initially, the fewer I have to reposition. Since moisture is the enemy of bonding, we give the patient two Sal-Tropine™* tablets to take one hour before the bonding appointment. They effectively dry the mouth and make the procedure more reliable. Check with your pharmacist for any contraindications.

Using the Bracket Slot for Alignment

Ultimately, the alignment of the slot on the tooth determines the tooth's final position in space. So basically, if you like the natural position of a tooth on the model, the slot should be aligned along the plane of the archwire. It is easy to visualize this, especially when wearing loupes. If two contact points are well aligned and root position is correct, any alignment of the slots that are uneven will disturb what Mother Nature did correctly. The only other positions you need to address are the height of the bracket on the tooth and its alignment along the height of contour. Check the positioning with a mouth mirror (Figure 3) from the incisal or occlusal aspect because, optically, it can fool you when looking directly at the facial aspect of the tooth. You will never eliminate rotations if the brackets are not centered in the middle of the teeth. When a tooth is rotated, I will even cheat a little to over-rotate it. If two contact points or marginal ridges are not aligned or root inclinations are not correct, you must compensate in your bracket placement so that when a flat, unbent archwire is placed, those contact points or marginal ridges will correct themselves. I don't use gauges to evaluate bracket height because tooth anatomy is so variable from side to side and tooth to tooth. Incisal edges and cusp tips will fool you. They aren't good referents.

Navigating the Archwires

Bone is very plastic and moldable if properly coaxed. With the initial archwires, we're trying to change the bony architecture with gentle pressure. If there's too much pressure, blood vessels in the periodontal membrane become compressed, causing pain and resulting in undermining resorption of the bone, a process that makes tooth movement a much slower process. This technology has forced us to think in terms of a different paradigm regarding how teeth move. In essence, we're trying to move bone, and teeth are the instruments of that bony change. If the next wire won't allow the bracket slides to close, it means that the patient isn't ready for that wire. This self-limiting feature of the Damon 2 is an excellent tool for determining wire progression.

The wire sequence I use begins with two Ni-Ti® Align™ SE wires, an .014 followed by an .016 x .025, and then two stainless steel wires, an .016 x .025 fol-

*Sal-Tropine is a trademark of Hope Pharmaceuticals.

Figure 4. Sometimes when a slide is difficult to close, you can use a Teflon-coated ligature wire to pull the wire into the slot.

IF TWO CONTACT POINTS ARE WELL ALIGNED AND ROOT POSITION IS CORRECT, ANY ALIGNMENT OF THE SLOTS THAT ARE UNEVEN WILL DISTURB WHAT MOTHER NATURE DID CORRECTLY.

lowed by an .019 x .025. Occasionally, it is necessary to use an .016 and/or .014 x .025 Ni-Ti Align SE as a transition wire after the .014. The first wires are left for one or two appointments (eight weeks apart). The main idea is not to force the next wire. When the slides close with little resistance, it's time to move on. Sometimes we need to engage a light wire where it's difficult to close the slide. A helpful technique is to use a Teflon®*- coated wire to pull the Align wire into the bracket slot so the slide can be closed (Figure 4).

After we place the .016 x .025 Ni-Ti Align SE wires, the next appointment is for a panoramic X-ray and evaluation of bracket positions for height, axial inclination and rotational discrepancies. Those brackets which are out of position are changed at that appointment and the .016 x .025 Ni-Ti Align SE wires are replaced to finish working out any rotations. This wire is usually left for one appointment before moving to the first stainless steel wire.

I believe the transition from .016 x .025 Ni-Ti Align SE to .016 x .025 stainless steel is important. It prepares the teeth to accept final working wires because it provides the first rigidity in the system but, more importantly, it doesn't fill up the bracket slot. This is critical because of the phenomenon I'm about to describe.

When I started using the Damon SL System, I was amazed at how quickly the teeth began to fit together during treatment. It wasn't until I studied my patients who were in Phase I treatment with upper and lower lip bumpers that I understood what was happening. We use .040 lip bumpers in .045 tubes (Figure 5). The fit is pretty loose and the lip bumpers have a lot of play. After a month or so, you notice that the occlusal anatomy of the upper and lower first molars fit together almost perfectly. Here is the answer. Teeth are wonderfully functional. As teeth erupt originally, light occlusal forces from chewing help inclined planes and cusp tips begin to find each other. With lip bumpers, light pressures create the osteoid matrix that allows teeth to move. Because the teeth aren't bound up with tight-fitting bumpers, occlusal forces simply fit the loosened teeth together. The same is true with the Damon System. Because teeth aren't bound up with elastomerics and are allowed to slide on the wire, occlusal forces begin to perfect the occlusion. Placement of each succeeding archwire depends upon the success of its predecessor. You will know when it is time to go to the next wire by the ease with which it's placed. An important point to understand is that with conventional bracket systems, you're accustomed to cinching the smaller wires tightly into the brackets to eliminate rotations. With the Damon System,

Figure 5. Lip bumpers are functionally similar to the Damon System, as both permit occlusal forces to fit teeth together.

*Teflon is a registered trademark of DuPont.

Staff Member Comment…
Tracy Martin, Head Clinical Assistant
17 years with Dr. Steffen

"Using Damon brackets hasn't only been a benefit to our patients, it's also improved how we work. I have found it much easier to train new staff with this bracket. They practice opening and closing the slides on a model. When they go to the chair, archwire changes become an easy and fast process, making appointments shorter. Also, we prepare our setup trays at the end of the day for the next day's appointments. Because of the simplicity of the Damon System, we need fewer instruments on the tray and don't use as many disposables such as ligature wires and O's, which helps reduce our costs."

THE TRUE MEASURE OF THE SYSTEM COMES WITH THE REWARDS OUR PATIENTS, MY STAFF AND I FEEL.

rotations may or may not be eliminated with the round wires. You have to be patient, understanding that only when you fill the .025 dimension with a rectangular wire will the rotations be eliminated.

Final finishing wires, .019 x .025 stainless steel, are usually placed after two appointments with the .016 x .025 stainless steel wires. Again, don't go to the next wire size if excessive pressure is needed to close the slides. You will simply be slowing down tooth movement. Make certain these wires are coordinated with each other and any torquing movements are accomplished with this last set of wires.

As our patients near the end of treatment, or *the countdown to removal*, we cut the archwires, leaving only an anterior section of wire from lateral to lateral in the upper arch and canine to canine in the lower arch. I instruct the patient to squeeze their teeth together as much as possible for a month. Chewing sugarless gum also helps. The wires themselves are often the greatest problem in fitting teeth together because they connect one tooth to the next and prevent vertical settling. Orthodontists tend to continue bending wires, trying to fit teeth together, but when the posterior teeth are freed by eliminating the wire, Mother Nature will do *her* thing. If the teeth have settled in during this time period, we'll schedule the patient for debonding. I use vertical cusp seating elastics if the teeth aren't ready. You'll be amazed how tightly the occlusion fits on the day of debonding.

The true measure of the system comes with the rewards our patients, my staff and I feel. My patients complain little about discomfort. The Damon system is gentle and the teeth move faster than with any system I've ever used. We aren't binding up the teeth with elastomerics, and with lighter pressure and the ability of the teeth to slide on the wires, the vascular supply to the periodontal membrane isn't compromised. There are also much greater efficiencies for the staff in terms of how easy the brackets are to work with, including shorter archwire changes and decreased chair time.

We usually see our patients at eight- to ten-week intervals because the appliances need time to do what they were designed to do. This appointment interval has allowed me to reduce the number of patients I see in a day, a win-win for us as well as the patients.

The Damon System 2 and its predecessor, the Damon SL, have made a huge difference in my practice. I applaud "A" Company and now Ormco for the foresight to continue to push this technology forward, and most importantly, I thank Dwight Damon for sticking with his vision of improving orthodontic treatment for patients and doctors alike.

Case 1

PRETREATMENT

44-year 5-month old female, Class II, with moderate upper and lower crowding, deep overbite and gingival recession at lower anteriors. Patient had convex facial profile with large chin button necessitating non-extraction treatment.

TREATMENT PLAN

Level and align to correct rotations and deep bite. Slightly advance incisors for lip projection.

PROGRESS

At 18 months into treatment, patient's buccal segments were fitting together very well with the use of the Damon appliance. Upper and lower .019 x .025 stainless steel archwires were placed as the finishing wires.

POSTTREATMENT

At 24 months into retention, patient displays excellent occlusion and healthy gingiva.

Case 2

PRETREATMENT

13-year 6-month old female, Class I malocclusion with a narrow maxilla, severe crowding and crossbite of the upper right lateral incisor. Facial balance and severe crowding indicate extraction treatment.

TREATMENT PLAN

Place upper and lower brackets. Level and align teeth. Close residual spaces and adjust arches with elastics.

Case 3

PRETREATMENT

36-year 3-month old female, Class I with moderate lower crowding and good facial proportions.

TREATMENT PLAN

Level and align teeth, open the bite and allow the appliances to gently align anterior teeth. Used bite props to unlock occlusion.

Case 4

PRETREATMENT

13-year 4-month old female, Class I malocclusion with mild upper and lower crowding and crossbite of the upper right lateral incisor.

TREATMENT PLAN

Place upper and lower Damon System 2 brackets. Level and align teeth. Adjust arches with elastics.

PROGRESS

Fourth visit after bonding. After 30 weeks of treatment, patient has .016 x .025 Ni-Ti Align SE wires in both arches.



PROGRESS

Second visit after bonding. At 16 weeks into treatment, patient's diastema closed and the incisors continued to align. Arhwires changed to .016 Ni-Ti Align SE.



PROGRESS

First visit after bonding. At 8 weeks into treatment, the upper right lateral moved out of crossbite. The patient has an .014 Ni-Ti Align SE in both arches. Notice rapid correction of upper right lateral incisor.



STRAIGHT•WIRE SYNTHESIS

Webster defines synthesis as the combining of separate elements to form a coherent whole. Straight-Wire Synthesis™ brings together in a single appliance all the traditional design features of an "A" Company Straight-Wire® Appliance (SWA) fused with proven enhancements. Synthesis is designed to capitalize on many of the advantages of the TruStraight-Wire® Appliance while offering aesthetics closer to the Mini-Twin. Synthesis represents yet another example of Ormco's commitment to the Straight-Wire System.

Proven Enhancements

The Straight-Wire Look and Performance You Know

Compound Contour

Torque in base

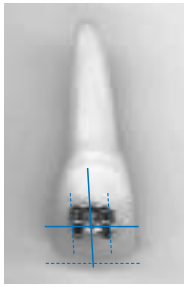
Level Slot Lineup

Fully Programed SWA

Rhomboid Design Throughout the Entire Synthesis System

The rhomboid bracket and pad design provide numerous references for accurate bracket placement.

- The vertical components of the bracket and pad align parallel to the crown long axis of the tooth.
- The horizontal components of the bracket align parallel to the bracket slot and occlusal plane of the tooth.



Improved Bond Retention

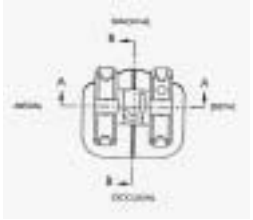
Optimesh® XRT is a treated 100-gauge pad that creates additional undercuts and increases the bonding surface area for a 35% improvement in bond strength.

When combined with anatomically contoured pads and the enhanced bonding area of the Synthesis base, Synthesis offers the SWA clinician unsurpassed bond strength.

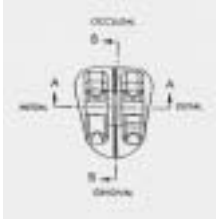
Optimesh XRT

Functionality with Aesthetics

Synthesis combines the rotational control of the TruStraight-Wire Appliance with the aesthetics of the Mini-Twin.



The bicuspid bracket has the same M-D dimension as TruStraight-Wire for optimal rotational control. Increased O-G and gingivally offset brackets maximize bond retention.



The lower laterals have the same M-D dimension as the Mini-Twin for ease of placement on severely malposed teeth.

Genuine Straight-Wire® Tradition

New Multimedia Choices from Top Clinicians

Power Whitening Instructional DVD by Drs. Jim Hilgers and Steve Tracey

Here's everything you need to know about tooth whitening, featuring Ormco's BriteFinish. Drs. Jim Hilgers and Steve Tracey provide you with an informative introduction to in-office power tooth whitening. You'll discover the difference between in-office and take-home whitening and how to incorporate both in your practice with BriteFinish.

The DVD includes:

- How to Market Tooth Whitening
- Conducting Patient Consultations and Patient Education
- Step-by-Step Instructions for Use
- Helpful Hints and Clinical Pearls from Drs. Hilgers and Tracey

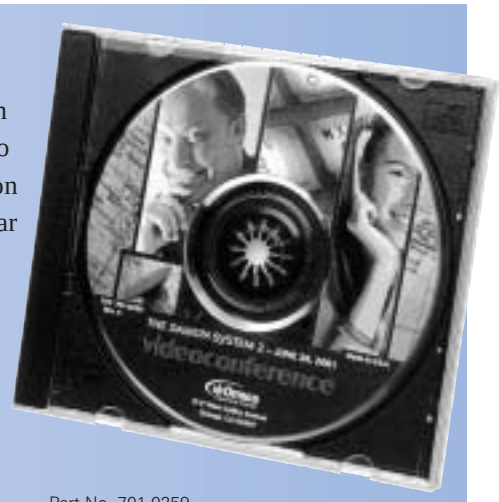
Part No. 701-0235

Damon Videoconference DVD, Featuring Dr. Dwight Damon

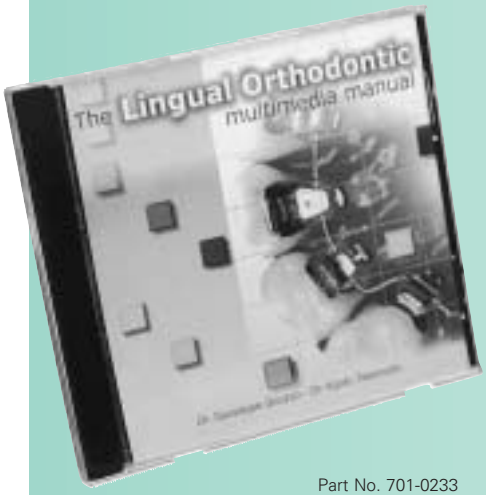
Whether you want to refresh your memory or catch something you missed, the Damon Videoconference is now available to you on DVD. It's a comprehensive look at how to use and maximize the benefits of the Damon System 2. See and hear Dr. Dwight Damon as he demonstrates techniques and procedures on patients. The DVD offers a modular format for easy navigation.

Modules include:

- Conversation with Dr. Damon's Staff
- All About the Low-Force System
- Understanding Friction-Free Orthodontics
- Damon Archwire Sequence
- How to Finish with the Damon System 2 Bracket



Part No. 701-0259



Lingual CD by Drs. Giuseppe Scuzzo and Kyoto Takemoto

Two well-recognized clinicians in the area of lingual orthodontics, Drs. Giuseppe Scuzzo and Kyoto Takemoto, have developed a CD to cover the many topics vital to successful lingual technique. It's a comprehensive course applicable for the doctor just starting or already practicing lingual orthodontics.

This CD features:

- Topics from Appliance Selection to Detailing Finished Cases
- Review of Clinical Cases
- Loaded with Illustrations, Photos and Video

Part No. 701-0233

For ordering information on these multimedia products, contact your Ormco representative or Customer Care at (800) 854-1741.

REDEFINING BRACKET ENGINEERING WITH TITANIUM DNA

Rohit C. L. Sachdeva, DDS, MS
Dallas, Texas

Today, the survival of our practices is based upon reengineering our care delivery approach to a patient-centric model. Such a model demands that we establish substantial value in the orthodontic care experience afforded to our patients. From a therapeutic perspective, it includes minimizing the number of interventional episodes, shortening the care cycle, increasing patient comfort and completing treatment on time without sacrificing quality of care. All of these requirements are compatible with a patient's notion of a quality-care experience.

Bond Failure – A Practice Efficiency Issue

Patient-driven needs certainly warrant that we explore avenues to further increase clinical efficiencies in our practices by identifying and controlling processes that negatively impact efficiency, such as bond failure. A recent study by Callaway[1] suggests that the loss of a single bracket for a patient seen monthly can easily add up to three weeks of extended treatment time. The loss of a bracket takes on even greater significance as we extend the intervals between patient visits. For instance, when a patient is seen every three or four months, loss of a bracket, if unrecognized before the subsequent appointment, may extend treatment time by a couple of months. In a 14-month care cycle, loss of two months in treatment time adds approximately 14% inefficiency to the care process. Bond failure is disruptive to our practices, impeding workflow, adding to the cost of clinical operations and setting back treatment. Furthermore, it imposes duress on a patient in terms of additional appointments to complete treatment. Unique solutions toward minimizing bracket failure[2] are required to build clinical efficiencies that drive a patient-centric care model.

Solution Engineering with Titanium

Titanium has revolutionized product engineering across all facets of the manufacturing industry. Its unique material properties—such as high strength-to-weight ratio, low modulus of elasticity and spring-back characteristics—have enabled the design of lighter aircrafts and better golf clubs and tennis rackets. Furthermore, from a biomedical perspective, it is considered the material of choice and is used diversely in medical products from hip joints to dental implants.

The orthodontic profession has also been the beneficiary of titanium technology; however, its use has generally been limited to archwires such as Copper Ni-Ti®, TMA® and Titanium Niobium, which have rewarded us with great gains in therapeutic efficiency. Titanium also allows us to expand these benefits into fixed appliances.

Recent advances in manufacturing technology have enabled us to design brackets from titanium and blend further refinements of the *best of class* features of the Orthos bracket to produce the Titanium Orthos2 bracket system.

Dr. Rohit Sachdeva received his dental degree from the University of Nairobi Dental School, Nairobi, Kenya. He completed his masters of science in oral biology and certificate in orthodontics at the University of Connecticut, School of Dental Medicine. He is a diplomate of the American Board of Orthodontics. Dr. Sachdeva was a professor in the Department of Orthodontics, Baylor College of Dentistry. He is recognized nationally and internationally for his work in materials and new approaches to care delivery. Dr. Sachdeva has published and spoken extensively around the world.

Titanium's Bond Strength Plus Durability Equals Bond Reliability

Several important characteristics of titanium combine to improve bond reliability and enhance durability. Generally speaking, our measure for a bracket's ability to resist bond failure has been its bond strength. We generally believe that the higher the bond strength, the greater the adherence of a bracket to the tooth and the lesser the likelihood of failure*. A much-neglected concept in understanding the resistance to bracket failure is bond durability.

The dynamic nature of the oral environment impacts bond durability. *When coupled, bond strength and durability ensure bond reliability.* This should be considered when selecting brackets.

Three Material Characteristics of Titanium Enhance Durability

The bond durability of titanium is greater than that of other brackets, which can be attributed to three main material characteristics: wettability, material stiffness and water absorption.

Compare a bracket pad to a slice of bread. When you spread peanut butter from edge to edge on a slice of bread, you increase the potential for the sandwich to stick together. The same holds true for a bracket. The more surface area the adhesive covers, the greater the adhesion to the tooth. It's titanium's *wettability* feature that translates to better bond durability and, thus, reliability. The contact angle of adhesive dropped onto a material indicates the material's wettability. When adhesive is placed on the bracket, it spreads. The smaller the contact angle, the more wettable the surface. Titanium demonstrates 60% greater wettability versus stainless steel by acrylic-based adhesives, allowing them to flow more easily into the undercuts of the pad for better penetration into the mesh openings (Figure 1).

Just as a titanium tennis racket reduces the transfer of the impact forces to the elbow, titanium brackets reduce impact force to teeth. While titanium is equal in strength to stainless steel, it has half the *stiffness* (Figure 2) so it acts much like a shock absorber. In fact, titanium brackets absorb 50% more impact energy than stainless steel; thus they translate 50% less force/energy to the bond. In addition to general chewing and swallowing forces, titanium brackets also protect the adhesive bond from high impact trauma forces.

Another characteristic of titanium that enhances reliability in the oral cavity is its increased resistance to *water absorption*. Titanium carries a rich oxide layer on its surface called titanium oxide, which facilitates a chemical bond of the adhesive to the bracket pad. The mesh in the pad affords a mechanical bond. The combination of the mechanical and chemical bonds provides a superior seal that prevents saliva from disrupting the bracket pad adhesive interface, which also encourages greater bond durability in addition to wettability and material stiffness.

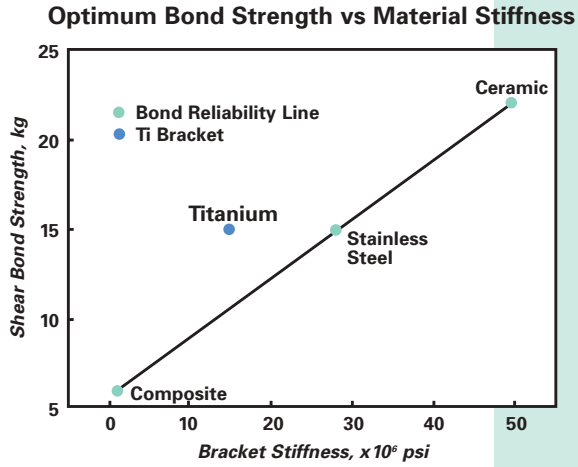


Figure 2. While titanium is equal in strength to stainless steel, it has half its stiffness. This increased flexibility absorbs 50% more impact energy and acts like a shock absorber for better bond reliability.

Titanium's 60% Greater Wettability Translates To Better Bond Reliability

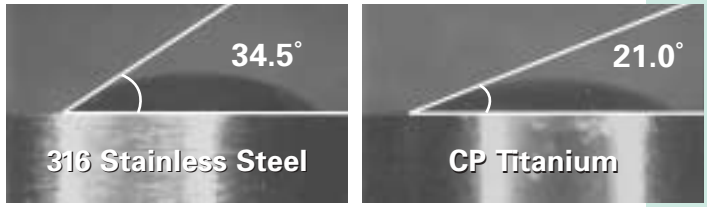


Figure 1. The contact angle of adhesive dropped onto a material indicates the material's wettability. The lower the contact angle, the more wettable the surface. Greater wettability increases bond reliability.

**Titanium Orthos2 brackets offer equivalent bond strength to stainless steel Optimesh® XRT, which has been shown to demonstrate more than 35% greater bond strength[3] than other mesh.*

Biofunctionality–A Patient Healthcare Issue

Our patients today are well informed about healthcare issues and information is *only a mouse-click away*. More than ever before, our patients are concerned about the nature and type of orthodontic devices used in their care. This concern has led to the demand for the use of *biofunctional appliances*.

When coupled, bond strength and durabilty ensure bond reliability.

Biofunction is an important feature to consider in the selection of brackets. These appliances are bonded to the dentition, remain in the mouth for the entire duration of treatment and are subject to corrosive attack from a variety of aggressive elements residing in the oral cavity that can lead to haptens leaching from brackets composed of materials such as stainless steel. Additionally, issues such as risk of enamel wear when the bracket grinds against opposing tooth surfaces and minimizing enamel damage during debonding are important characteristics to be considered. Engineering with titanium gives us the added benefit of unifying these design requirements into brackets for reliability and biofunctionality.

Three Material Characteristics of Titanium Enhance Its Biofunctionality

Corrosion Resistance

The rich oxide layer on the surface of titanium provides great resistance to chemical and thermal insult. Titanium is 70 times more *corrosion resistant* than stainless steel. Just as a cut on the surface of the skin heals itself, an injury to the surface of titanium is *healed* by rapid oxidation. This characteristic minimizes the leaching of any possible toxic ions that can potentially cause harmful biological side effects.

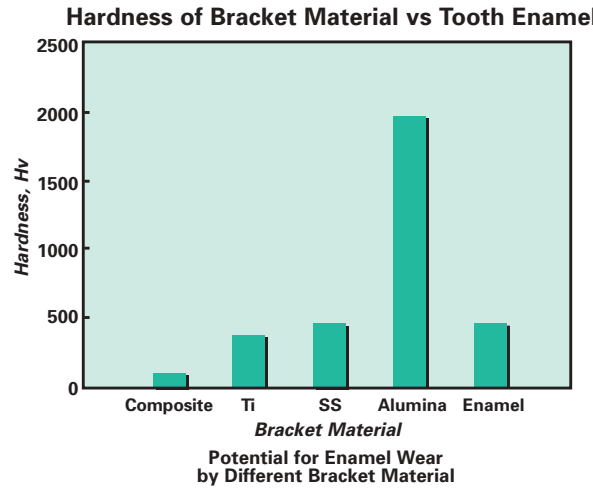


Figure 3. Although the strength of titanium is equal to stainless steel, the hardness (ability of a material to resist indentation) is approximately 25% lower than stainless steel. This leads to less potential wear when the titanium brackets contact enamel.

Wear Characteristics

A common clinical problem is the interference between tooth surfaces and brackets, which can promote wear of the tooth surfaces. Although titanium has very high strength, the *surface hardness is quite compatible with teeth* (Figure 3) and, therefore, minimizes the risk of tooth notching during grinding against titanium surfaces.

The rich oxide layer on the surface of titanium provides great resistance to chemical and thermal insult. Titanium is 70 times more corrosion resistant than stainless steel.

Debonding Characteristics

The stiffness characteristics of titanium and the chemical/ mechanical bond it creates between the adhesive and the bracket combine for *better separation of the adhesive from the tooth* during debonding. Doing so minimizes the adhesive remnants left on the tooth surface and causes less likelihood of enamel fracture. As a result, less tooth surface-finishing procedures are required that can potentially cause gouging.

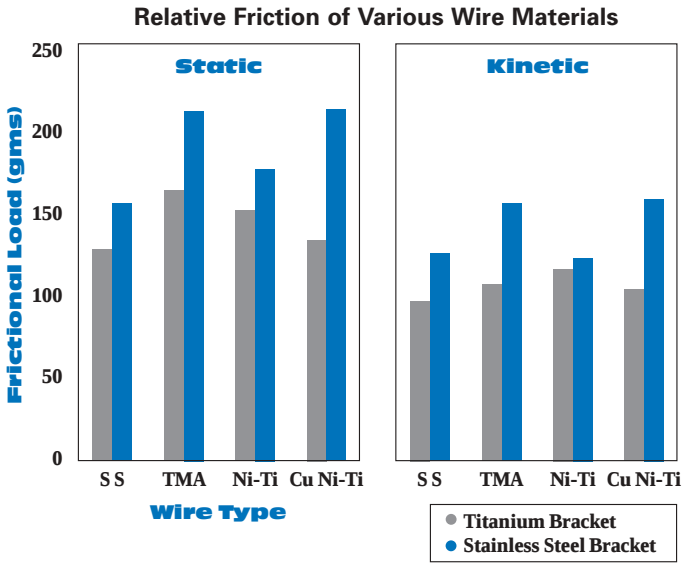


Figure 4. When tested with the most popular archwires, titanium brackets demonstrate frictional characteristics as good as, if not better than, stainless steel.

Titanium's Frictional Properties Foster Sliding Mechanics

Since many orthodontists perceive that friction between the archwire and bracket slots impedes tooth movement, frictional characteristics of any bracket material are always of concern. The frictional properties of titanium are at least equal to stainless steel for sliding mechanics consistent with current treatment methodologies (Figure 4) as cited in frictional studies Kusy[4] conducted. One reason is that the rich oxide layer on the surface of titanium brackets acts as a lubricant to allow sliding between the archwire and the slot interface.

Conclusion

The new millennium orthodontic practice will be patient centric. Its success will be closely linked with the adoption and systematic use of titanium and its alloys for the full range of orthodontic appliances.

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PLEASE STAY!

CREATING AN ENVIRONMENT FOR STAFF RETENTION

Janette Piankoff, Ph.D.
Consultant, Pivotal Designs
Newport Beach, California

Have you noticed it's relatively easy to retain mediocre staff and increasingly difficult to keep your top performers? Whether the unemployment rate is 4.4% or 8.4%, specific steps must be taken to encourage top performers to stay. Employees have more career choices than ever before and heightened expectations about their professional development. They anticipate expanded job duties, greater responsibility, promotional opportunities and, yes, financial reward. If those expectations are not met, they are likely to look elsewhere. Whereas employees used to be loyal to an employer, they are now loyal to their career or their profession. But that doesn't mean you are powerless to stop them from job-hopping. Some relatively simple steps can be taken today to keep top staff.

How to Retain Top Performers

1. Communicate

You may hesitate to acknowledge a top performer for fear of alienating others. You can't afford to make this mistake. Top performers often *just do their job* and may not realize how much you value them and that you consider them to be one of your stronger employees. According to Marshall Goldsmith, a leading employment consultant in San Diego, many top performers, when asked why they left a job, report, "No one ever asked me to stay." What a simple oversight. Don't wait for the annual review process to tell your valued staff members that you need them to stay. It may be too late. Make the time to have a sincere, meaningful conversation with each of your key staff members. Explain exactly why you consider them a top performer; they may just be *doing their job* and not realize what they do that makes them *above average*. Assure them that they are an integral part of your practice.

2. Question

Ask your top performers what they like about their job, the office and working for you. Ensure these things stay in place. Then, ask them what ideas they have about their professional development while in this position. Don't be shy about saying, "I want you to stay. What will it take to keep you here?" Of course, you can't give them everything they want; however, knowing what they want is a start. Be honest about what you can and cannot do, then follow through with any ideas you can accommodate. Employees who receive that type of focused attention appreciate you even asking. In addition, they'll be more likely to approach you when disgruntled rather than keeping silent and conducting a job search.

3. Reward

Yes, financial reward and promotions are common retention tools, however, you may not have a lot of flexibility in these areas. The good news is that these are not the only motivators and you can be flexible in designing individual reward systems for top performers. For instance, recognition for one employee may come in the form of expanded duties such as taking the lead on a problem-solving taskforce. Another may prefer time off with pay to take care of personal matters or the opportunity to be included in a critical decision about the practice. While employees need to be treated fairly and consistently, you can *and should* differentiate the treatment between high performers and low performers. High performers should receive higher pay, expanded job duties and exposure to as many opportunities as possible.

Today's employee is business savvy, technologically advanced, creative and in control of their professional destiny. By focusing on your top performers through meaningful conversation and creative management, you're well on your way to creating an office of tenured, satisfied staff.

Dr. Piankoff was previously head of recruitment and training at Ormco while conducting seminars as part of the Practice Development Seminar team. She will be a featured speaker on the staff program at the Gorman Institute in Orlando, Florida, Jan. 31 – Feb. 2, 2002.

the case of two sisters – correcting transverse discrepancies

Laurie L. Fricke, DDS
Covington, Louisiana

Figures 1a-b. The type of expansion required by the patient will dictate which Spring Jet to use: single telescopic arm for slow expansion or double telescopic arms for rapid expansion.

In recent years, the introduction of the Spring Jet™* expansion appliance for correcting transverse discrepancies represents an alternative to the Hyrax or jackscrew-type expander in cases where maxillary expansion is necessary. The Spring Jet is less bulky, which not only provides more tongue space and increases patient comfort but also improves oral hygiene due to less plaque retention on the appliance. When comparing the Spring Jet to the Hyrax, the most significant improvement is the ease of activation. The clinician simply compresses the nickel-titanium spring every four to six weeks to maintain constant pressure, eliminating the need for a parent to turn a key at recommended intervals. For these reasons, the Spring Jet has significant advantages when compared with a Hyrax expander.

The Spring Jet is available in two configurations with single or double telescopic arms. When determining which device to use, I evaluate the type of maxillary expansion my patient requires. Maxillary expansion has traditionally been described as slow or rapid palatal expansion. Dentoalveolar and orthopedic are other terms that have been used to express the biological principles of slow and rapid maxillary expansion. If your patient requires slow maxillary expansion, the Spring Jet I with a single telescopic arm (Figure 1a) should be used to create a dentoalveolar force. When the nickel-titanium single open-coil spring is completely compressed, 400 gm of force is applied. If rapid maxillary expansion is needed to create an orthopedic force, you can use the Spring Jet II with double telescopic arms (Figure 1b). The double springs create 800 gm of force to distract the midpalatal suture. Since tooth movement in addition to skeletal expansion is inevitable when the midpalatal suture is widened, the ideal patient for the Spring Jet should exhibit the following:

- Bilateral posterior crossbite
- Initial dental and skeletal constriction
- No preexisting dental expansion

*Spring Jet is a trademark of American Orthodontics, Inc.

Dr. Laurie Fricke received her dental degree from Louisiana State University School of Dentistry in 1986. Two years later she graduated from the orthodontic residency program also at LSUSD. She is a diplomate of the American Board of Orthodontics and fellow of the International College of Dentists. Dr. Fricke has served as president of the Northlake Dental Association and is a member of the American Association of Orthodontists, Southern Association of Orthodontists, Louisiana Orthodontic Association, LSU Orthodontic Alumni Association and other national and state dental associations. Since 1988, Dr. Fricke has practiced orthodontics in Covington and Bogalusa, Louisiana. She lives in Mandeville, Louisiana, with her husband and their three children.

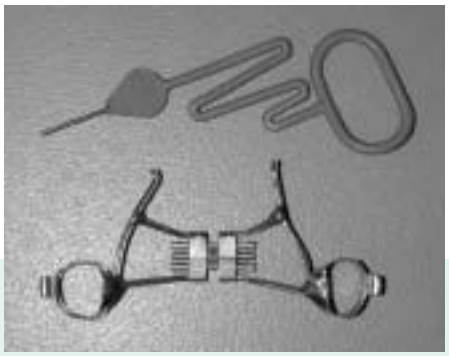


Figure 2. This Hyrax appliance was fabricated for the patient shown in Case 1 and was cemented to the maxillary first molars. The parent used the key to turn the expansion screw once a day to activate the Hyrax.

I HAVE FOUND THAT PARENTS ARE ELATED WHEN THEY LEARN THAT THEY DON'T HAVE TO TURN A SCREW ON THE SPRING JET EXPANSION APPLIANCE.

Sisters Wear Different Appliances for Maxillary Expansion

In addition to my preference of the Spring Jet over the Hyrax, my patients prefer the Spring Jet as well. I had the opportunity to treat two sisters who had Class II, division 1 malocclusions of the mixed dentition and similar bilateral posterior crossbites with upper and lower anterior malalignments.

I treated the older sister, who was 10 years 2 months, with a Hyrax (Figure 2) cemented to the maxillary first molars and instructed the parent to turn the Hyrax once a day. After expansion was completed over a 12-week period, the Hyrax was tied off and left in place for six months and was later replaced with a Transpalatal Arch for further retention.

A year and a half later, I treated the younger sister, who was 9 years 4 months, with the Spring Jet I. Upon insertion, the appliance was cemented to the maxillary first molars, with the nickel-titanium coil spring completely compressed. Six weeks later, at the following appointment, the crossbite was corrected and the Spring Jet was left in place with the coil inactive for retention. I treated her with the Spring Jet instead of the Hyrax because I viewed the Spring Jet as a more efficient appliance with improved patient comfort.

A Mother's Perspective on Treatment

After asking the girls' mother to compare the two appliances that her daughters had worn, she said she preferred the Spring Jet instead of the Hyrax for several reasons. First, she didn't have to turn the Spring Jet. Even though the key for the Hyrax was on an elastic handle, she was always afraid she would drop the key down her daughter's throat. Second, she admitted that she dreaded putting her hand in her daughter's mouth each evening to turn the key because she felt as if she were hurting her daughter. Third, she said that treatment took longer with the Hyrax than with the Spring Jet. One reason for the increase in treatment time with the Hyrax occurred when her oldest daughter went to camp for two weeks and there was no one to turn the appliance. The mother was particularly pleased with the noncompliance feature of the Spring Jet and preferred it to the Hyrax.

A case that would not be suited for the fixed Spring Jet design would be a young patient with rotated first molars. In these cases, much of the constriction and lack of space is a result of Class II molar rotations. In a case like this, a removable Spring Jet could be used. However, in our practice a quad helix would be cemented to rotate the maxillary first molars and thereby expand the maxillary arch. Maxillary expansion cases are frequently coupled with other dental problems. Various design options can be incorporated into the basic Spring Jet to correct other dental problems simultaneously with expansion. For example, a crib (Figure 3) can be incorporated into the Spring Jet I for habit modification.

Figure 3. The Spring Jet can be configured with a crib for habit modification.

I have found that parents are elated when they learn that they don't have to turn a screw on the Spring Jet expansion appliance. Since working in the mouth is commonplace for us, it may be difficult to understand how nerve-racking it is for the parent to work in their child's mouth. The Spring Jet relieves the parent of this task, making it the responsibility of the orthodontist.

Case 1

PRETREATMENT



10-year 2-month-old female, Class II, division 1 malocclusion of the mixed dentition. The patient displayed bilateral posterior crossbites with upper and lower anterior malalignment.

POSTTREATMENT



After 12 weeks of treatment, the Hyrax was tied off and left in place for six months. It was replaced with a Transpalatal Arch for retention with a bonded lingual arch from lateral incisor to lateral incisor. Phase II treatment was anticipated after the remaining permanent teeth erupted. Expansion after two years of retention.

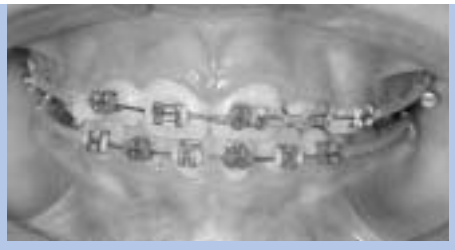
Case 2

PRETREATMENT

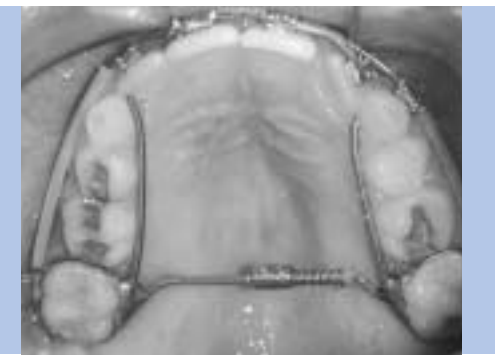


9-year 4-month-old female with Class II, division 1 malocclusion of mixed dentition. Patient displayed bilateral posterior crossbites with upper and lower anterior malalignment.

POSTTREATMENT


Spring Jet 1 was cemented to the maxillary first molars. After six weeks of treatment, the crossbite was corrected and the appliance was left in place with the coil inactive for retention. Brackets were bonded to anterior teeth to align the upper and lower incisors.



LAB POINTERS

Clinicians choose appliance designs and associated treatment mechanics to suit their individual philosophy and style of practice. Spring Jet appliances may be used in the maxilla or mandible (Figure 4) and fabricated as removable or fixed (soldered molar connection) designs. The removable version incorporates a double-back insertion wire placed through lingual sheaths on the molars to adjust molar position in three planes of space. Auxiliaries such as buccal tubes and habit cribs may be incorporated into the appliances, whether removable or fixed. The habit crib works well with the Spring Jet I but is not suitable with the Spring Jet II because of design limitations. When you send the case to AOA/Pro, provide a work model with the molar bands seated in the impression before pouring in orthodontic stone. We can fit the molar bands on the work model if necessary. For more information, contact Alex Vargas in Sturtevant, Wisconsin, at (800) 262-5221 or (262) 886-1050.

Figure 4. For mandibular expansion, a modified Sprint Jet is more comfortable for the patient than a jackscrew-type appliance.

Alex Vargas originally joined Professional Positioners, Racine, Wisconsin, in 1983. He came to the United States in 1980 from Cuba and took classes for three years to learn to speak English. Alex was hired as a technician and had a natural skill for appliance design and fabrication. He became the first technician assigned to development and fabrication of the Spring and Distal Jet appliances. His many years of experience with the performance of these appliances make him uniquely qualified to answer questions about the Spring Jet I and II.

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order information

Titanium Orthos2™ Brackets

Maxillary	Torq.	Ang.	CIS	.018 Left	.018 Right	.022 Left	.022 Right
Central	+15°	+5°	0°	448-6111	448-6110	449-6111	449-6110
Lateral	+9°	+9°	-4.5°	448-6211	448-6210	449-6211	449-6210
Cuspid	-3°	+10°	0°	448-6311	448-6310	449-6311	449-6310
Cuspid–hook	-3°	+10°	0°	448-7311	448-7310	449-7311	449-7310
1st Biscuspid	-6°	0°	0°	448-6411	448-6410	449-6411	449-6410
1st Bicuspid–hook	-6°	0°	0°	448-6413	448-6412	449-6413	449-6412
2nd Bicuspid	-8°	+4°	0°	448-6511	448-6510	449-6511	449-6510
2nd Bicuspid–hook	-8°	+4°	0°	448-6513	448-6512	449-6513	449-6512

Mandibular	Torq.	Ang.	CIS	.018 Left	.018 Right	.022 Left	.022 Right
Central	-5°	+2°	0°	448-6615	448-6610	449-6615	449-6610
Lateral	-5°	+4°	-4.5°	448-6625	448-6620	449-6625	449-6620
Cuspid	-6°	+6°	-4.5°	448-6711	448-6710	449-6711	449-6710
Cuspid–hook	-6°	+6°	-4.5°	448-7711	448-7710	449-7711	449-7710
1st Bicuspid	-7°	+3°	0°	448-6813	448-6812	449-6813	449-6812
1st Bicuspid–hook	-7°	+3°	0°	448-6815	448-6814	449-6815	449-6814
2nd Bicuspid	-9°	+3°	0°	448-6911	448-6910	449-6911	449-6910
2nd Bicuspid–hook	-9°	+3°	0°	448-6913	448-6912	449-6913	449-6912

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34 mm (Black)	215-0023	215-0033	215-0043
36 mm (Red)	215-0024	215-0034	215-0044
38 mm (Green)	215-0025	215-0035	215-0045
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Central	+12°	+5°	0°	Twin	338-0111	338-0110	339-0111	339-0110
Lateral	+8°	+9°	0°	Twin	338-0211	338-0210	339-0211	339-0210
Cuspid	-2°	+13°	4°	Twin	338-0311	338-0310	339-0311	339-0310
Cuspid–hook	-2°	+13°	4°	Twin	338-1311	338-1310	339-1311	339-1310
Cuspid–hook	-2°	+9°	4°	Twin, special	338-1351	338-1350	339-1351	339-1350
Bicuspid	-7°	0°	2°	Twin, G/O	338-0511	338-0510	339-0511	339-0510
Bicuspid–MG hook	-7°	0°	2°	Twin, G/O	338-2511	338-2510	339-2511	339-2510
1st Molar–hook (weldable)	-14°	0°	14°	Triple micro tube	137-0086	138-0086	137-0143	138-0143
2nd Molar–hook (weldable)	-14°	0°	14°	Single-slot micro tube	137-0106	138-0106	137-0181	138-0181

Mandibular	Torq.	Ang.	Rot.	Bracket Type	.018 Left	.018 Right	.022 Left	.022 Right
Anterior	-1°	+2°	0°	Twin	338-0011	338-0010	339-0011	339-0010
Cuspid	-11°	+7°	2°	Twin	338-0411	338-0410	339-0411	339-0410
Cuspid – hook	-11°	+7°	2°	Twin	338-1411	338-1410	339-1411	339-1410
1st Bicuspid	-17°	-1°	4°	Twin, G/O	338-0611	338-0610	339-0611	339-0610
1st Bicuspid – hook	-17°	-1°	4°	Twin, G/O	338-1611	338-1610	339-1611	339-1610
2nd Bicuspid	-22°	-1°	4°	Twin, G/O	338-0711	338-0710	339-0711	339-0710
2nd Bicuspid – hook	-22°	-1°	4°	Twin, G/O	338-1711	338-1710	339-1711	339-1710
1st Molar (weldable)	-30°	-1°	4°	Double micro tube	137-0170	138-0170	137-0251	138-0251
2nd Molar (weldable)	-30°	-1°	4°	Single-slot micro tube	137-0200	138-0200	137-0285	138-0285

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