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Message from the President

Paul Keel

It's been roughly a year since Lehman Brothers declared bankruptcy. While we've come to understand that economic growth began to slow a few quarters earlier, this event has become emblematic of when it all began and serves as a useful landmark from which to gauge progress.

There's little question that the past twelve months have been a roller coaster – near panic in global financial markets, steep contraction in major industrial sectors, and declining patient starts in several orthodontic markets. And these lows have been matched by equally improbable highs including sweeping administrative changes in several democracies and recent runs in nearly all major stock markets.

Curiously, while markets have been moving at dizzying rates, many market participants have sat frozen. In periods of uncertainty, the natural tendency is to play it safe. Wait and see. Don't risk it.

But position is relative. We may remain still but our environment and those in it continue to move. If we're not moving forward, we could well be falling behind. And this may be the greater risk.

Happily, our industry does not generally attract the do-nothing type. And indeed over the past twelve months, Orthodontics has continued its steady march forward. Once novel treatment modalities like TADs and lingual are now becoming mainstream. Still newer approaches like CBCT have taken their place at the cutting edge. In Boston, we saw more new digital technologies – imaging, software, custom appliances – than ever before. And the research community remains prolific. Intellectual debates continue to rage. The marketplace of ideas has never been richer.

Unitek turned 60 last year and while our core will never change – we will always strive to be the most trusted provider of innovative and personalized solutions to orthodontic professionals and their patients – we're also pressing to be better today than we were yesterday.

Geographically, we continue to add to our team around the globe. You'll have seen new Unitek faces in every region of the world. Organizationally, we completed the integration of Lingualcare and TOP-Service companies, unveiling a harmonized product design and the Incognito™ brand at the North American Users Meeting earlier this fall. Doctors in over 60 countries are now using the Incognito System to deliver excellent orthodontic results, over a full range of clinical cases... invisibly!

In terms of new product introductions, 2009 will be our most productive year in almost a decade. We launched the first lower arch solution for the Clarity™ SL Self-Ligating Appliance System, the new generation of our Lava™ Digital Models, and the 3rd generation of SmartClip™ Appliances. Wires engage in SmartClip™ SL3 Brackets with up to 43% less force than with the original appliance. We launched Forsus™ EZ2 Class II Correctors, which attach in minutes, and the Ortholux™ Luminous Curing Light, which cures in seconds (for ceramic, three to be precise.) On top of all this, we made our one-and-only MBT™ Versatile+ Appliance System even better, with a wider selection of brackets and tubes than ever before.

I've seen the same bias for action from you. I see it in your papers and I see it in your practices. I see it in your schools and I see it in your students. It's been said that you can't stop progress. Looking around our industry, I'm proud to say that that certainly appears to be the case.

Keep pushing yourselves and keep pushing us. Because if we're not moving forward, we could well be falling behind.

Best,
Paul
Since 1998, the core-orientation (niche) of my practice has been to use Clarity™ Aesthetic Brackets exclusively. To clarify, I use Clarity Appliances from second bicuspid to second bicuspid, upper and lower, on almost all case starts. I also use lingual Incognito™ Orthodontic Braces and clear aligners on the balance.

I began with traditional ligated Clarity ceramic brackets, but now I use the Clarity™ SL Self-Ligating Brackets, which became available in 2007. Certain specific conditions, like the length of the clinical crown of the lower incisors, will occasionally prevent the use of Clarity brackets. For example, the clinician has to be able to position the slot of the bracket on the lower incisor at 4 mm or more from the incisal edge to prevent contact, and possibly wear, of the upper incisor incisal edge. In these cases, I use brackets from the Victory Series™ Appliance System or the SmartClip™ SL3 Self-Ligating Appliance System.

Using Clarity SL Self-Ligating Appliances brings us to the core discussion of this article: Self-Ligation. Is self-ligation something new, or are we just reinventing the wheel?

For the record, the first self-ligating bracket was invented in 1933 by J.W. Ford, and it was called “The Ford Lock”. After that first attempt, several others were made; in fact, eight other self-ligating brackets were designed from 1933 to 1973, until (finally) one received broader clinical acceptance. That being the “Edgelok®” appliance.

The reason why most first generation self-ligating brackets never received clinical acceptance was because the memory wires (Nickel-Titanium in all versions and combinations) were not available. With the arrival of the memory wires in the early 1970’s came the clinical acceptance of some of the first self-ligating brackets (Edgelok, Activa®, Speed®, etc.). But again, until then, none of these brackets were considered to be aesthetic. That was until 3M came out with their aesthetic self-ligating solution, Clarity SL brackets.

The purpose of this article is not to elaborate on the benefits of self-ligation – there is a lot of material and many clinicians out there doing this already. I would, however, like to demonstrate how I have incorporated Clarity SL brackets into my practice, and the benefits of doing so.

Clinical Case Study

On the clinical side, one of the greatest advantages of using self-ligating brackets is the fact that we can almost completely eliminate the use of elastomeric ligatures and power chain. Nobody will argue against the benefits of this point as it applies to oral hygiene. Furthermore, the benefit on the aesthetic side, no more yellow elastic ties or chain, is of particular significance to adult patients who are smokers and coffee drinkers. The clinician should not forget that the Clarity SL bracket design is based on that of a regular twin bracket, and therefore still allows the use of elastomerics as needed for particular mechanics (anchorage, to create friction, to accentuate a movement, or to simply please a patient who would like colored elastomerics).

Let’s look at a clinical case and how I avoided the use of power chain to close space in a treatment with extractions. In this case, the goal was to please a patient who wanted to avoid the discoloration of elastomeric ties.
Patient
Female, 17 years 5 months.

Chief complaint
“I’m not able to bite with my front teeth.”

Diagnosis
Bi-maxillary protrusion with a Class I molar relation, dento-alveolar protrusion, anterior open bite, tongue thrusting, lip protrusion an incompetency.

Treatment Plan
(Figures 1-9)
After discussion with the patient and her parents about the patient’s expectations from treatment and the changes to her profile and teeth, the surgical option was eliminated.

Extraction of four first bicuspids and retraction of the anterior segment.

Possibility of using a Nance bonded appliance to increase anchorage for maximum retraction, but only once we have control of the vertical so we do not slow down the intrusion process of the posterior for the control of the vertical.

Clarity™ SL Self-Ligating Brackets upper/lower with indirect bonding technique using Dr. Anoop Sondhi’s open bite chart for bracket positioning.

Since we are using indirect bonding, the extractions will be performed after the initial bonding appointment.

Bonding Appointment
(Figures 10-15)
Clarity SL brackets upper/lower 0.018” slot.

0.014” SE wires from cuspid to cuspid.

Transbond™ Plus Band Adhesive on the occlusal surface of the upper molars to prevent contact between the upper teeth and the second molar brackets. Since we are following the open bite bonding chart, the position of the brackets on the molars is more occlusal so interference is possible in the initial stages of treatment.

Prescription to see her dentist for extractions before next visit in 8 weeks.
1st Visit – 8 Weeks After Initial Bonding
(Figures 16-20)
0.018” SE wires upper/lower from second molar to second molar.

Use of an elastomeric ligature on the upper left and lower right cuspids to obtain full engagement of the wire (Note: This is one of the great benefits of Clarity SL brackets. Because it is, in essence, a regular twin bracket, the clinician can use preferred techniques to treat cases.)

Transbond™ Plus Band Adhesive was moved from the upper first molars to the upper second molars, with the same purpose (i.e. to prevent contact between the upper teeth and lower brackets).

No retraction mechanics for now – relying only on the friction free environment and asking the patient to try to close her lips as much as possible, thus creating a labial force on the anterior teeth.

2nd Visit – 18 Weeks After Initial Bonding
(Figures 21-23)
Note the improvement in the OB/OJ relation without mechanical retraction.

3rd Visit – 26 Weeks After Initial Bonding
(Figures 24-26)
Wire change to 0.017” × 0.025” Nitinol Classic

Addition of crimpable or surgical posts on the distal aspect of the cuspids. These posts should be placed as close as possible to the bracket to prevent spacing of the anterior teeth while retracting the anterior segment. Aesthetically it is far better than a metal figure 8 from cuspoid to cuspoid, or a piggy back, and also better than an elastomeric power chain that would surely change color over time.
For retraction, you can use your device of choice: Class I elastic mechanics from the molar to post, retraction coils, or whatever you prefer. Doing retraction on a nitinol wire can, depending on the retraction forces, accentuate the Curve of Spee. With use of self-ligating brackets without ligatures, the retraction forces can be reduced, thus reducing the potential accentuation of the Curve of Spee.

Update: This case is 33 weeks into treatment, and as seen in Figure 28, significant improvement has been made in correcting the anterior open bite and smile profile.

As I mentioned in the beginning of this article, “We are not reinventing the wheel” but we can definitely see and appreciate the advantages of self-ligation in our day-to-day procedures. In fact, everyone (starting with the patient) benefits from this new technology and from these not-so-new but re-invented principles. The good news, once again, is that 3M Unitek now offers a complete self-ligating system. So, no matter what your technique is, the size of the slot, or the prescription you’re using, the system can accommodate your preferences. Furthermore, an aesthetic appliance can now not only meet your clinical requirements, but also complement your marketing strategies or practice niche.
Dr. Patrice Pellerin Clarity™ SL Bracket Tips

Clarity™ SL Self-Ligating Bracket Features

- Stainless Steel Archwire Slot Liner
- Bi-Directional Ball Hook
- ID Dimple with Color Ink Dots
- Nitinol Self-Ligating Clips
- Rounded, Dome-Shape Tie-Wing Design
- Fine Grain, Strong Ceramic
- Clip Retaining Rotation Arm
- Ceramic Injection Molded

Instruments for Bracket Placement

**Cuspid to Cuspid (Upper and Lower Arches)**
Unitek™ Bracket Placement Instrument #804-171

**Bicuspids and Molars (Upper and Lower Arches)**
Positive Posterior Bracket Seater
Orthopli #094-PP, OrthoTechnology #OT-2222

**Refinement and Final Positioning**
3M Unitek Sickle-Style Cement Remover and Bracket Positioner
#900-822

Bracket Handling Cuspid to Cuspid

**Note:** Always ensure correct instrument positioning when handling the brackets, making sure your instrument rests above the mesial and distal protrusions.

Laterally
Buccolingually
Important! Rest your pliers above the protrusions.
**Bracket Positioning**

**Vertical**
We utilize the vertical slot as a reference guide to assess bracket placement in line with the long axis of the tooth, for rotation and inclination control.

An advantage of the Clarity™ SL Bracket is that the clips provide two additional reference points (because they are parallel to the vertical slot of the bracket) thereby offering three reference points for bracket placement.

**Horizontal**
The metal slot of the Clarity SL bracket (as with the Clarity bracket), facilitates visualization for vertical positioning.

**Height Gauges**

**Use of Positioning Gauges at 45° Angle:**
With indirect bonding procedures being used more and more, precise positioning is even more important with the self-ligating appliances. When using the MBT™ Versatile+ Appliance System gauge it is important to use it at a 45° angle to the labial surface of the slot. That way you prevent the gauge from getting caught in the clip. Also note that the gauge shouldn’t be used to seat the bracket; if you do so, be aware that you may induce a change in the torque expression.

**Flash Removal**
Use a scaler or explorer to remove excessive adhesive around the bracket and under the mesial and distal protrusions.

**Clarity™ SL Bracket Modification**
The injected molded ceramic construction of Clarity SL brackets has yielded a bracket stronger than the Clarity™ Ceramic Bracket. However, this does not prevent the clinician from making bracket modifications as needed. In this case, the patient felt discomfort caused by the cuspid hooks due to the strong lingual crown torque of the cuspid. Therefore, the hooks were removed.

**Note:** Use a high-speed hand piece with lots of water to ensure that the bracket and adhesive stay cool during the modification process.
Use of the Vertical Slot

In those cases with severe vertical or lateral displacement, rather than forcing the archwire into the slot, loop a ligature wire through the vertical slot to the archwire. This allows for initial correction without generating high binding frictional forces. The Clarity™ SL Appliance System is the only self-ligating system that provides this feature.

Wire Engagement and Disengagement

- It is extremely important to always provide lingual support for the teeth when engaging a wire
- Engage round wires with finger pressure only
- It is recommended to engage rectangular or square arches using the appropriate instrument (Unitek 804-152/804-153) as is necessary to ensure that the wire is in line with the slot of the bracket before applying pressure to engage it

To maximize patient comfort, the following wire disengagement sequence is recommended:

1. Cuspid*
2. Opposite Cuspid
3. Central
4. Opposite Central
5. Lateral
6. Opposite Lateral
7. Second Bicuspid
8. Opposite Second Bicuspid
9. First Bicuspid (if needed)
10. Opposite First Bicuspid (if needed)
11. First Molar (if needed, wire cinch)
12. Opposite First Molar (wire cinch)

*Note: Some practitioners prefer starting the disengagement sequence with the laterals since teeth with smaller roots feel more pressure.
To increase patient satisfaction, here is the most compelling reason to use aesthetic brackets (Clarity™ SL or Clarity™ Brackets) from second bicuspid to second bicuspid (or at least from 4-4). The use of aesthetic brackets from cuspid to cuspid will satisfy only 6% of your patients looking for an aesthetic solution. The use of aesthetic brackets from first bicuspid to first bicuspid will increase patient satisfaction to 55%. However, if you use aesthetic brackets from second bicuspid to second bicuspid, you reach 96% of patient satisfaction. This is what an aesthetic solution should be.

### Number of Teeth Typically Displayed in an Unforced Smile

<table>
<thead>
<tr>
<th>Teeth Numbers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 (6)</td>
<td>6%</td>
</tr>
<tr>
<td>14 (5)</td>
<td>49%</td>
</tr>
<tr>
<td>15 (4)</td>
<td>41%</td>
</tr>
<tr>
<td>16 (3)</td>
<td>4%</td>
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Using FDI Tooth Identification System

Maximizing Patient Satisfaction with Aesthetic Brackets

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<tr>
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<th>Use</th>
<th>Notes</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire 1</td>
<td>.014” Nitinol SE</td>
<td>Initial wire for all cases</td>
<td>In severe crowding, the wire will not be engaged in both tie-wings</td>
</tr>
<tr>
<td>Wire 2</td>
<td>.014” Nitinol SE Tandem</td>
<td>Completion of leveling and alignment</td>
<td>Insert second archwire over the existing .014” wire</td>
</tr>
<tr>
<td>Wire 3</td>
<td>.017” x .025” Hybrid Nitinol SE</td>
<td>Initiate 3rd order corrections and space closure</td>
<td>Avoid rectangular wires with less then .025” in the horizontal dimension</td>
</tr>
<tr>
<td>Wire 4</td>
<td>.018” SS sectional wire 3-3 or 2-2</td>
<td>For use with vertical settling elastics when last tooth of sectional is to be pulled by the elastics</td>
<td>Elastic use is usually only at night. If elastic wear is 24/7, then treatment interval is 3 weeks</td>
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**Clinical images provided by Dr. Pellerin.**
Successful Management of Miniscrews in Orthodontics:
An Interview with Dr. Jason B. Cope

by Jason B. Cope, DDS, PhD, Adjunct Associate Professor, Department of Orthodontics, St. Louis University; Private Practice of Orthodontics, Dallas, TX

Editor’s Note:
The use of miniscrews in orthodontics has grown rapidly from a novel concept a few years ago to a commonplace occurrence today. As is true with any new technology, greater familiarity can lead to more questions about effective use. Some of these questions were posed recently by the Journal of Clinical Orthodontics to a panel of orthodontists. The design of a miniscrew contributes to its function and performance; unfortunately, only three miniscrew designs were represented in the discussion, so there is an opportunity to address the question by way of other designs. Dr. Jason B. Cope contributes here to the discussion with his own perspective on these critical questions, drawing from years of practice, research and developing clinical techniques for miniscrew usage.

In what types of cases have you used miniscrews?
Dr Cope: I have used miniscrews in a wide variety of cases. However, I think there is a need to resist our temptation to place a miniscrew on every case for which a miniscrew is feasible to only cases in which the diagnosis indicates the anchorage requirement is beyond that which traditional orthodontic anchorage is capable. In that respect, I place miniscrews on approximately 20-25 percent of my cases. Those cases include posterior intrusion for openbite closure, anterior intrusion for deepbite opening, entire maxillary arch intrusion for gummy smile elimination, molar uprighting for mesioangular dumped molars, molar protraction for congenitally missing or extracted premolars, canine or anterior en masse retraction, Class II upper arch distalization, Class III lower arch distalization, molar intrusion for superuption, retraction/extrusion for impacted canines, unilateral maxillary intrusion for occlusal cants, unilateral maxillary widening for unilateral crossbites, and temporary replacement of lateral incisors.

Have you been able to avoid surgical procedures through the use of miniscrews?
Miniscrew implant anchorage can avoid surgical procedures in several ways. 1) Complete avoidance of surgery altogether, 2) minimization of the amount of surgery required, and 3) elimination of restorative implants and restorations. For example, maxillary posterior dental intrusion allows openbite closure without surgery. In cases with cantled maxillomandibular occlusal planes, miniscrews can be used to correct the maxillary cant, thereby requiring only an asymmetric mandibular surgical procedure. Finally, patients with congenitally missing lower second premolars can eliminate the need for implants/restorations by having miniscrews placed to protract the molars. It is important to point out that the patient’s chief complaint is critical here. For patients who desire maximum facial change, traditional orthognathic surgery may be the only choice available to achieve the desired results of an ideal occlusion and facial aesthetics.
Do you sometimes use miniscrews in cases that require less than maximum anchorage?

The term maximum anchorage, or actually any definition of anchorage to this point, is pointless. They are all wholly and completely inaccurate and inadequate. They were based on the premise of dental and auxiliary, yet non-skeletal, anchorage. Moreover, they were based purely on the anteroposterior dimension. If we distalize or protract teeth, do we not change the vertical dimension? The same is true for expansion or constriction. The point here is that the current anchorage definitions are outdated and only take into account one of three dimensions. Having said that, clinically, I determine if I can achieve the treatment goals with traditional anchorage; if not, I consider miniscrews for anchorage.

Is there a minimum or maximum age for using miniscrews?

In my cases, I have found no difference in any 10 year age group increment from 10-70 years old. I have placed miniscrews in 10 year old boys and girls and in adults up to 62 years old. It is possible to set limits; however, I think they would be arbitrary. In general, bone tends to be more pliable in younger patients, usually under about 10 years of age. Perhaps a better standard than age would be to develop scientific criteria based on CBCT data for bone density, thickness, and quality.1

Are there any other contraindications to the use of miniscrews?

Contraindications are divided into absolute and relative. Patients with absolute contraindications should not be treated with TADs at all. These include titanium allergies/hypersensitivities, localized acute infection, recent radiation therapy, past/current IV bisphosphonate therapy, metabolic bone disorders, or poor bone healing. Patients with relative contraindications should only be treated with TADs if the condition can be controlled or eliminated prior to TAD placement. These include past/current oral bisphosphonate therapy, poor oral hygiene, inadequate patient compliance, insufficient interradicular space.2

What are the effects of bisphosphonates?

Bisphosphonates are a class of drugs that specifically and irreversibly bind osteoclasts and cause them to undergo programmed cell death or apoptosis. This decreases bone turnover and increases bone density.3, 4 Although this is beneficial for patients with osteoporosis, bone diseases, and metastatic bone cancer, there are known side effects. Bisphosphonate-related associated osteonecrosis of the jaws (BRONJ), is a non-healing area of exposed bone in the oral and maxillofacial region. Unlike osteoradionecrosis, BRONJ is not responsive to hyperbaric oxygen, and most, if not all, treatments are palliative only. While it is rare to see this with oral bisphosphonates, it has been observed. The reader is referred to the American Association of Oral and Maxillofacial Surgeons, who have recently updated their position paper on dental procedures for patients taking oral and/or intravenous bisphosphonates.5

What is the risk with diabetic patients?

As long as the diabetes is under control, diabetic patients are at no greater risk than other orthodontic patients. I would, however, educate them as to the importance of immaculate hygiene and the increased risk of infection.

Please describe your preferred screw design.

I use the drill-free, thread-forming IMTEC™ Ortho Implant.6 It is unique in that the first 4.5 mm is tapered or conical. The remainder is a 1.8 mm cylinder. The reason we designed it this way was so that we had an increased diameter and hence greater surface area in the cortical bone with the full 1.8 mm diameter. The tapered tip starts at 0.35 mm and gradually increases up to the final 1.8 mm. This feature makes the miniscrew drill-free, requiring no pilot hole. It also means that the interradicular component is less than 1.5 mm in diameter, so it can be placed anywhere in the oral cavity with adequate bone. We also chose to not have a rectangular slot, to prevent the application of torsional forces thru the long axis of the miniscrew, which increases the risk of failure.7, 8

When is it necessary to drill a pilot hole to insert a miniscrew?

I have not drilled a pilot hole in over 4 years, as it increases the risk of failure. At most, I use a #2 round bur to drill a small 0.5-1.0 mm deep pilot notch in thick/dense cortical bone to start miniscrew advancement. This has only been necessary in the retromolar area and rarely there.6
Do you ever use miniplates for anchorage?
To date, I have not found a need for miniplates. I have been able to use miniscrews for all of my anchorage requirements.

Before placing a miniscrew, do you take any diagnostic records in addition to your normal pretreatment records?
Standard orthodontic records are all that are required — namely models, lateral cephalometric radiographs, and panoramic radiographs. I have an Iluma™ (IMTEC, a 3M Company, Ardmore, OK) in my practice and use it on every patient for diagnosis and treatment planning in lieu of traditional radiographs. However, I primarily use clinical evaluation and tactile sense for miniscrew placement. Cone beam data is particularly valuable for older patients with long-term missing teeth, pneumatized sinuses, or concern for bone quality/quantity.2

What locations do you find the most reliable for successful miniscrew placement for particular types of cases?
I have the best success rates (95% or better) when placing miniscrews on the buccal alveolar surface mesial to the maxillary and mandibular first premolar (distalization and deepbite correction, anywhere in the hard palate or palatal alveolar surface (distalization, openbite correction, en masse retraction), and in the infrazygomatic crest (intrusion and en masse distalization/retraction).1

Which locations are the least reliable?
I have lower success rates (85-87%) when placing miniscrews on the buccal alveolar surface in the maxillary and mandibular posterior regions distal to the second premolar, the maxillary tuberosity, and the mandibular retromolar region.1

What anatomical considerations are there in the maxilla regarding miniscrew placement?
I have placed miniscrews in the sub-ANS region, the buccal alveolar process, the infrazygomatic process, the palatal alveolar process, and the hard palate. The greater palatine foramen and nasopalatine canal should be avoided. Pneumatized sinuses with less than 1.5 mm of outer cortical bone thickness should be avoided. The maxillary midline suture should be avoided in growing patients.2

What anatomical considerations are there in the mandible regarding miniscrew placement?
I have placed miniscrews in the mandibular anterior region where more caution is needed due to the smaller interradicular space. I have also placed them in the buccal alveolar process, the external oblique ridge, and the retromolar area. The external oblique ridge can be problematic as the cheek mucosa often falls over the head of the miniscrew in this region during mastication and can easily get traumatized. The mental foramen should be avoided. It emerges at the level of the premolar apices which makes encroachment unlikely.2

Do you place your own miniscrews?
Absolutely! I have been placing them since 2003, and have seen no reason to refer them to another specialist.

Initially, I had two oral surgeons place the first 11. The problems we encountered were increased doctor time to meet and discuss the biomechanical needs of the case, lack of the surgeon’s understanding of orthodontic biomechanics, miniscrews placed by surgeons in the wrong or unusable location, increased cost to the patient, and increased time out of school or work for the patient and/or parent. Considering the biomechanical knowledge, the treatment plan, desired outcome, and patient care, placement of miniscrews for orthodontic anchorage is ideally performed by the orthodontist.

Placement of miniscrews for orthodontic anchorage is ideally performed by the orthodontist.

Do you use a topical anesthetic or local infiltration, or both, before miniscrew insertion?
I use topical anesthetic only, if at all possible. In 2004, I saw great resistance of orthodontists to place miniscrews due to the “surgical” appearance of the procedure and need for local anesthetic injections. It became readily apparent that in order to motivate orthodontists to engage the process, the technique would have to be fast, simple, and “nonsurgical”. Therefore, I developed the first minimally invasive, topical anesthetic only placement technique for miniscrew implants.
Much like extracting a tooth, placement of a miniscrew involves two sensations—pressure and pain. The nerve supply of bone comes from the periosteum, which is richly innervated by sensory periosteal nerves. In addition, bone is viscoelastic and so responds to internal pressure (either via tooth removal or miniscrew insertion) by expanding. This expansion causes fluid flow through the bony canaliculi, which patients perceive as pressure9. Teeth and periodontal ligament (PDL), on the other hand, have sensory (afferent) innervation from the Trigeminal Nerve, which when activated, stimulate pain.10

Considering the foregoing, if the soft tissues and periosteum are anesthetized, the bone doesn’t have internal innervation. Logically one would want to anesthetize only the soft tissue and periosteum, leaving the tooth root and PDL unanesthetized. This, then allows a patient to be completely sensate and able to detect the proximity of the miniscrew during insertion before contact is ever made with the tooth root. Therefore, I began to develop an atraumatic, topical anesthetic miniscrew placement protocol with Oraqix (Dentsply Pharmaceutical, York, PA), a high strength periodontal topical aesthetic. After a year of clinical trials, we formally introduced this as the Cope Placement Protocol™ in 200511. A year later, I switched to a more potent, high strength topical anesthetic, DepBlu (Steven’s Pharmacy, Costa Mesa, CA), which provides profound soft tissue and periosteal anesthesia but has limited aesthetic effect on tooth roots and PDL. There are several benefits: The procedure is much simpler in that local infiltration by injections are unnecessary and there is little risk of anesthetizing the tooth root so the potential of hitting the tooth root is almost impossible.

In about 15% of cases, I will use the Madajet (MADA International, Carlstadt, NJ) needle free pneumatic syringe when the soft tissue is thicker than about 2 mm². Importantly, this still anesthetizes only the soft tissues and periosteum.

Have you ever moved a root into a miniscrew?
Not to my knowledge.

Do you use a miniscrew placement guide?
Miniscrew guides, to be quite honest, are for fearful orthodontists, and not for patients. The guides take extra time to make, are inaccurate and misleading at best, are dependent on the accuracy of the angle of the X-ray tube head, require multiple radiographs, only pinpoint the starting point of a miniscrew, and do not account for the trajectory or final position of the miniscrew12. A much safer option is to use clinical evaluation, tactile sense, and the topical placement protocol explained above.

Have you ever hit a root during miniscrew insertion?
The only way to know if a root has been touched by a miniscrew is to extract the tooth and visually inspect it, which I do not recommend. I have, however, had patients experience an increased sensitivity upon miniscrew placement. In those cases, I would stop advancing the miniscrew and leave it in place for 60 seconds. If after 60 seconds, the patient no longer feels the sensitivity, the diagnosis was fluid flow thru the bony canaliculi, i.e., pressure and not root contact, and I continue advancing the miniscrew. If however, the patient still feels the sensitivity after 60 seconds, the diagnosis is that the screw is either contacting the root or the periodontal ligament. At this point, if the full diameter of the miniscrew is not in bone, I back the miniscrew out about 1-1.5 mm change the insertion angle 10-20 degrees and reinsert it. If the full diameter of the miniscrew is in cortical bone before suspected root contact, I remove the miniscrew and place it in another location.

References
Prologue:
What next? You’ve attended almost every course on Temporary Anchorage Devices (TAD), and Mini-Screw Implants (MSI). You’ve read the numerous publications in the AJO/DO, JCO and other orthodontic journals about the benefits of incorporating MSI in to your orthodontic practice. You’ve decided on a manufacturer, purchased the kit, the necessary anesthetics and accessories. Finally, you’ve met the patient who in your best clinical judgment requires MSI anchorage to assist you in obtaining the desired clinical result. The next question: Where is the best place to place my first MSI?

Many sites have been advocated by numerous clinicians and academics as the “sites of choice” for placing MSI1. Recently, with the advances in maxillofacial imaging, many publications have documented the bone quantity and density in the most popular interdental sites for MSI placement2, 3. However, for the clinician new to the world of MSI anchorage, the idea of placing a mini-screw in between tooth roots may be quite intimidating.

Soon after placing my first MSI interdentally, I started searching for the ideal alternate site for mini-screw placement, not due to fears of accidental root contact, but because all too often, interdental MSI placement limit tooth movement as they would inevitably be in the path of moving teeth. This is especially problematic when moving the entire arch in the AP direction. Sites such as the retromolar area, maxillary tuberosity, infrazygomatic region and the palate all provide a placement location away from teeth, with limited potential damage to the dental roots and other vital anatomical structures. However, only the palate provides a versatile location that could be used for most anchorage sensitive cases. The purpose of this publication is to review anatomical and biomechanical factors that confirm the palate as an optimal location for efficient, effective, and predictable site for mini-screw placement.

Anatomical Factors
A common concern for many clinicians using mini-screw implants interdentally is the potential complications that can arise during MSI placement. Limitations of interradicular bone, deviations in placement angle, impingement of the PDL space, and potential cementum contact have all been reported as potential complications of mini-screw placement4. In addition, there are concerns about the stability of the MSI in certain interdental sites. Areas such as the mandibular incisor region and the maxillary tuberosity have reduced bone density, and minimal cortical bone thickness, not to mention limited interdental space in the mandibular incisor areas, leading to reduced stability and success rates for MSI placed in these regions2, 3.

The palate on the other hand, presents with thick, dense cortical bone levels, making it one of the most suitable sites for successful MSI placement. Other than the incisive foramen, the palate provides a site of limited potential for nerve and blood vessel damage from MSI placement. Furthermore, the palate is covered with keratinized tissue of ample thickness, which presents an environment that naturally limits tissue irritation and inflammation5. In addition, access for mini-screw placement is simple if proper contra-angled drivers are utilized. However, the clinician should always aim to place the MSI in the paramedian region,
near and not directly on the midpalatal suture, as the suture may not be fully ossified, especially in younger patients.

Computed Tomography studies have determined palatal bone thickness is greatest in an area within 1 mm of the midpalatal suture, at the level of the first premolars. The bone thickness decreases as we progress posteriorly and laterally along the palatal walls. A 6 mm mini-implant should be placed at the level of the 1st premolar at an angle of 20-30 degrees to the vertical to ensure that its full length is in bone (Figure 1), and maintain a safe distance from the incisive foramen and the apices of the maxillary incisors.

Palatal Placement Protocol

For the most part placing a MSI in the palate is similar to placement in any other intraoral site. Upon the application of a compound topical anesthetic, the tissue thickness should be measured. In cases that the tissue is more than 2 mm thick, local infiltration or a Madajet spray is indicated to allow for profound anesthesia. Generally, for tissue thicker than 2 mm, a tissue punch would allow for removal of excess soft tissue before placement the MSI (Figure 2).

My personal MSI brand of choice for palatal anchorage is the 6 mm IMTEC™ Ortho Implant, as it is one of the most versatile mini-implant systems available. The Ortho Implant has a tapered designed with a diameter of 1.8 mm (Figure 3). In a study of various common brands of orthodontic mini-implants, the Ortho Implant was the only mini-implant that did not fatigue and fracture during placement, recording the highest peak torque values during placement. This finding is of great significance when placing MSI in dense palatal cortical bone, which can lead to higher insertion torque values. The kit includes all required armamentarium required for palatal mini-screw placement, including, a soft tissue punch, a contra-angled (LT) driver (Figure 4) and healing O-cap.

The O-cap is made of stainless steel, making it an invaluable part of an indirect anchorage system, where the MSI can be connected via a soldered connecting bar to a tooth. This tooth can then be used as the anchorage unit to move other teeth (Figure 5a, 5b, 5c).

Figure 1: 6 mm IMTEC™ Ortho Implant SMI placed in the palate. Note placement angulation at 20° to the vertical.

Figure 2: Tissue punch to remove thick Keratinized palatal mucosa.

Figure 3: IMTEC Ortho Implant.

Figure 4: Placement of palatal MSI using the IMTEC™ Ortho Implant contra-angled (LT) Driver.

Figure 5A: Working model for fabrication of custom TPA using the IMTEC Ortho Implant O-cap.

Figure 5B: TPA arms soldered to O-cap.

Figure 5C: TPA in place, fixed to maxillary first molars.

Figure 6A-B: Interdental MSI loaded using coil springs. Note vertical force vector as a result of direct loading of the MSI.

Figure 7: TPA-MSI appliance design for en-masse retraction of anterior teeth.
Biomechanical Factors

When a MSI located at a distance away from the archwire is loaded with a nitinol coil spring or a chain, it introduces a force vector in the vertical dimension (Figure 6a, 6b). This vertical force often causes a bowing in the archwire, leading to an exaggerated Curve of Spee along with increased friction during space closure. Though this side-effect is simply overcome during the final stages of treatment, it can be worrisome to the orthodontist new to using MSI in conjunction with conventional orthodontic mechanics.

The main advantage of the indirect anchorage system attainable by palatal MSI-TPA combination is that they rarely require any alterations in treatment mechanics. Consequently, the clinician can continue to use the same conventional orthodontic mechanics to which they are accustomed. Depending on the design of the MSI-TPA appliance, a palatal mini-implant can be used for en-masse retraction of anterior teeth (Figures 7, Figure 8a, 8b, 8c), or distalization of the entire maxillary arch (Figure 9a, 9b, Figure 10a, 10b).

A single MSI in the palate can also be used for the intrusion of supraerupted teeth (Figure 11), or the entire maxillary arch in order to correct an anterior openbite (Figure 12), as intrusion mechanics are more favorable when performed from the palatal aspect. In addition, the use of palatal anchorage can also reduce the number of mini-screw implants required per patient. In most cases, the same MSI can be used for distalization, retraction, or intrusion of teeth, simply by altering the design of the TPA attached.

Conclusion

Since the time of Edward Angle, the control over the position of the maxillary molar has been a major key for successful treatment of any orthodontic case. Many appliances have been devised over the years for this purpose, including a transpalatal arch, Nance appliance, headgear, and the pendulum appliances, to name a few. However, most of these appliances either depend on patient compliance, or have some form of anchorage loss, as none can defy Newton’s third laws. However, MSI located in the palate can predictably control not only the maxillary molar position, but also the position of almost every tooth in the mouth. The palate offers a safe haven for orthodontists, novice and experienced, to maximize efficiency of orthodontic treatment, in an effective manner.

References

Editor's Note:
The Incognito™ Appliance System is designed to serve the growing preference for invisible, convenient and comfortable orthodontic care. With 100% customized brackets, archwires, and bonding trays, the Incognito appliance system addresses many of the barriers to predictable and efficient treatment outcomes found with previous generations of lingual appliances. Because the Incognito appliance system features fixed brackets, it can be used to treat a wider range of case types than other invisible treatment options.

Though the Incognito appliance system has been used to treat tens of thousands of patients, this system is relatively new to many orthodontists. This article looks at some of the key product design features that contribute to the clinical experience.

V-Hook Tie-Wing Design
The Incognito™ Appliance System features brackets and archwires with 100% customized prescriptions. The customized prescriptions are determined by the doctor-driven case setup.

As with traditional appliance systems, the interplay between the customized archwires and customized bracket slots governs the expression of the customized prescription. Ligation techniques can shape and optimize the interplay between the customized archwires and customized brackets.

The V-Hook tie-wing of the Incognito appliance system is designed to facilitate ligation techniques. Ligation techniques, such as the “double over tie” and the “power tie,” are used to fully seat the archwire into the slot of the bracket and optimize the delivery of the custom prescription. The V-Hook makes it easier to execute ligation techniques (Figure 1).

Figure 1: V-Hook Tie-wing Design.

Winnie Fong earned a B.S. in Microbiology from University of California, Davis. She joined 3M Unitek as a lab technician after working at the pharmaceutical firm Genentech Inc. for 6 years. Winnie is presently an Advanced Product Development Engineer.

EDUCATIONAL OPPORTUNITY

The Secret Behind a Beautiful Smile
Learn more about the Incognito™ Appliance System at a special presentation with Dr. Cliff Alexander, Thursday, March 11, 2010, 12:00 p.m. – 5:00 p.m., Bellagio Hotel, Las Vegas.

For more information and to register, call 800-852-1990 ext. 4469 (US) or 800-443-9002 ext. 4469 (Canada).

This event is being held prior to the 3M Unitek 13th Annual Summit, held March 12-13 at the Bellagio. For more information on the Summit, see the ad on the back page of this issue.
Self-Retaining Auxiliary Slot
The lower anterior brackets of the Incognito™ Appliance System feature a self-retaining auxiliary slot. This auxiliary slot can accept and retain .012 and .014 round wires (Figure 2).

There are three basic advantages offered by the self-retaining auxiliary slot feature. First, the self-retaining auxiliary slot can be used in combination with light round wires to create a passive self-ligating treatment option. This technique can be used to unravel crowding in the lower anterior. Second, use of the self-retaining auxiliary slot allows the practitioner to use more length of the archwire and better manage deflection forces when unraveling cases. Third, the self-retaining auxiliary slot feature allows the practitioner to maintain wire placement without the use of a ligature or tie-in, and remove the wire without the need to remove a ligature.

Customized Pad Design
Bond reliability plays a central role in treatment efficiency. This is true whether the bracket system is customized, standardized, lingual or labial. To optimize bond reliability, the customized pads of Incognito appliance system brackets are designed to take full advantage of each tooth’s bonding area and morphology.

Pad size is one variable that can affect bond reliability. With considerations given to potential areas of interference, the bracket pads of the Incognito appliance system are designed to optimize the bonding area of each tooth. Not only can the customized pad size help optimize bond reliability, but it can also facilitate precise bracket positioning and placement during rebonding procedures. (Figure 3).

The customized pads of Incognito appliance system can take full advantage of each tooth’s unique morphology. Often Incognito appliance system bracket pads extend onto the occlusal surface, particularly with premolars and molars. These occlusal extensions can help safeguard the bond from shearing forces that can lead to bond failures.

Cylindrical Bracket Body Design
The cylindrical bracket body design of the Incognito appliance system considers the need for precise expression of the prescription, ease of use, sliding mechanics and patient comfort. The Mesial-Distal dimension of the archwire slot is optimized with the intent of offering torque control, rotational control (in vertical slot brackets), tip control (in horizontal slot brackets) and interbracket distance (Figure 4).

Another benefit of the cylindrical bracket body design is ease of use with ligatures. Clinicians noted acute and angular bracket body and tie-wing designs tended to abrade ligatures, causing unwanted failures. The smooth and radiused design of Incognito appliance system bracket body and tie-wing areas are designed to minimize the risk of unwanted ligature failures.

Summary
The Incognito appliance system can be used to serve the growing patient preference for invisible, comfortable and convenient orthodontic care. Though there are many patient-oriented benefits, the 100% customized Incognito appliance system is also designed to help orthodontists deliver a premium standard of care. A host of features and optimizations, such as the V-hook tie-wing and the self-retaining auxiliary slot, are designed to offer the predictability, efficiency, ease of use and treatment outcomes expected by clinicians.
An Introduction to the Lava™ Treatment Management Portal

By Leonard A. Liptak and David Kuhns

Prologue:
3M Unitek introduced Lava™ Digital Models in early 2009. Lava digital models offer orthodontic offices a convenient, digital alternative to plaster models. Orthodontists take impressions and ship them to 3M. 3M scans the impression into a Lava digital model and stores the digital model for 14 years. Orthodontists may access, view and utilize the digital model using the free-of-charge Lava™ Treatment Management Portal. Recently 3M Unitek released the second generation of the Lava treatment management portal.

The 3M Commitment
One widely believed business myth is the so-called “first mover advantage.” In other words, the early bird gets the worm. Authors Al Ries and Jack Trout espouse the benefits of being first to market in their book, The 22 Immutable Laws of Marketing. In fact, being first to market is the very first law the authors mention (Ries A., Trout J., The 22 Immutable Laws of Marketing, 1994, HarperCollins, New York, 1994, p. 2).

Though seductively simple, a host of empirical research papers refute the so-called first mover advantage. For example, a paper published in MIT’s Sloan Management Review concludes that being “best” is, in fact, more important than being “first.” The paper finds that variables such as “persistence, commitment, vision, asset leverage and continuous innovation” have a significantly bigger impact on enduring market leadership than being first. (Tellis, G., Golder, P., First to Market, First to Fail? Real Causes of Enduring Market Leadership, January 15, 1996, http://sloanreview.mit.edu/).

The recent release of the Lava™ Treatment Management Portal (TMP) 2.0 underscores 3M Unitek’s goal of being the “best.” A 3-D digital media viewer, Lava TMP 2.0 offers a handful of new features that makes it convenient to display, store and use Lava™ Digital Models. These features demonstrate how feedback from orthodontists fuels continuous innovation at 3M Unitek. Let’s take a closer look at some of the new, key features of Lava TMP 2.0.

Design Software Interface
A balance between form and function is a fundamental aspect of any design. It should be no surprise that early users of the Lava TMP voiced the need for simplicity and functionality. The challenge was to ensure a full suite of features, but not so many that they interfered with the ease of use.

The Lava™ TMP 2.0 Graphic Users Interface design also takes into consideration that many people in an orthodontic practice are involved with models. Assistants might make impressions for a model and fill out a lab order form. The orthodontist might use the model to take measurements. A treatment coordinator might reference a model in a new patient consultation.
In Lava™ Treatment Management Portal, the “Elevator Panel” design helps the various users in the orthodontic practice to quickly find the features that they need to complete their tasks (Figure 1). The elevator panel design offers quick and easy to access features that are germane to specific and discrete activities such as Patient Record Management, Model Viewing, Analytical Tools, Annotation Tools and Report Creation.

Integration with Practice and Image Management Applications

Many early users indicated the need for interaction between Lava digital models and their practice or image management software programs. New patient consultations are the most common situation where it can be helpful to access a patient’s Lava digital model while viewing other diagnostic images.

New patient record taking and lab ordering are two less obvious, but important, situations where integration can improve the efficiency. No longer will orthodontic assistants need to add patient information to lab order forms, as the data already exists in the image or practice management software, and can be easily accessed.

Lava TMP 2.0 addresses these situations through a unique approach to integrations with practice and image management programs. This unique approach begins with the creation of the patient record. Once the patient record is created, the orthodontic practitioner simply clicks the Lava digital model icon in the image or practice management software. If no model exists for the patient, the patient record is automatically populated in the Lava TMP. The Lava digital models digital lab order form is then automatically populated with the patient and order information. This eliminates the redundancy of filling out patient records and digital model lab order forms (Figure 2).

If a Lava digital model already exists for a given patient, clicking the Lava digital model icon in the practice or image management software will directly generate the patient digital model record in the Lava TMP 2.0. This is designed to facilitate treatment planning and new patient consultation situations (Figure 3).

Measurements and Calculations

In addition to offering value when storing or displaying models, Lava TMP 2.0 allows orthodontic practitioners to take and calculate the most frequently used treatment measurements. Lava TMP 2.0 offers tools for Overjet, Overbite, Archlength, Tooth Width, and other point-to-point and multi-point measurements. These measurements can be taken on the tooth’s surface, or on the occlusal plane tool. Measurements may also be combined to calculate Bolton and Archlength discrepancies (Figure 4, 5, and 6).

Figure 1: Elevator Panels allow easy access.

Figure 2: New Patient information auto-populates

Figure 3: Existing patient information is checked for data accuracy

Figure 4: Populating the tooth chart with data for later calculations

Figure 5: Data from tooth chart is used for Bolton and Archlength discrepancy calculations

Figure 6: Overjet and Overbite auto-populates with adjustable measurements
Additional Features

A range of additional features has been added to make Lava™ Treatment Management Portal (TMP) 2.0 both convenient and useful. This includes more robust print options, local model file caching for faster model retrieval, a “right-click” menu option for fast navigation, new preference settings, automatic upgrades, and enhancements to the ordering process. For example, with Lava TMP 2.0, doctors can print the Lava™ Digital Models in any view, in full page size, including a print to PDF for electronic sharing. Lava TMP 2.0 also offers a Print 1:1 option, complete with rulers, to verify the dimensions of the model and the measurements being taken (Figure 7 and 8).

Lava TMP 2.0 is an exciting new addition to the 3M Unitek family. The Lava TMP 2.0 offers a convenient and powerful way to store, view and analyze Lava digital models. The many new features added to the Lava TMP 2.0 software viewer represent the beginning of 3M Unitek’s commitment to achieving enduring leadership as digital technologies intersect with the orthodontic industry.
3M Unitek Virtual Learning Center

3M Unitek has launched a new educational website dedicated to product information and technique education. Designed for Orthodontists and professional staff, available resources will include training modules, informational presentations and Tips and Tricks when using 3M Unitek products.

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