Recently a number of us experienced in Damon® System mechanics gathered to share our current protocols and discuss how we can enhance treatment to provide greater efficiency and higher quality results for our patients. The consensus of the group was that Damon practitioners can make many decisions in treatment planning and the early stages of treatment that will simplify the finishing stage and greatly improve the quality of our case results. This article summarizes those discussions and includes what I believe are three essential practices to achieving the ultimate in efficiency and excellence with Damon System mechanics: using variable torque, disarticulating the occlusion with bite turbos and beginning light elastics early in treatment.

**Essential #1 – Begin with the End in Mind: Match Torque Selection to Case Goals**

Simulating a patient-specific prescription using variable torques is one of the most expedient means of achieving the desired final positions of teeth and roots. The Damon System offers a number of torques for upper and lower anterior teeth (Figure 1). Matching ideal torque values to your setup – while taking treatment mechanics such as Class II elastics into account – allows the roots to begin to upright as bracket torque expresses during the light rectangular wire leveling phase. Differential torque can shorten treatment time and, I feel, enhances stability by allowing the crowns to spend as much time as possible uprighted over their roots before the teeth are debonded. In this manner, we will spend less time in the finishing stage of treatment placing selective torque into finishing wires. For example, clinicians can select high-torque maxillary anterior brackets for Class II, division 2 cases or in Class II, division 1 cases, high-torque maxillary anterior brackets and low-torque mandibular incisor brackets to counteract the forces of Class II elastics (to be addressed a little later in the article).

To reiterate, applying variable torque fosters earlier initiation...
of torque in the rectangular leveling phase and maximal expression of palatal root torque prior to the completion of treatment.

**Getting Torque in a Passive Self-Ligating Appliance.** To get a better appreciation for the advantages of employing the variable torque options available in the Damon System, it is important to review how bracket torque functions. As we all know, when we engage a rectangular wire of sufficient size into the lumen of a bracket, the torque prescription of that bracket will begin to express itself. There has long been a misconception that an archwire must press firmly against the base of a bracket for it to express the desired bracket torque; however, discounting the wire-to-lumen play operating in any bracket system and any offsetting mechanics, such as Class II elastics, it takes only two edges of a rectangular archwire engaging the opposing walls of a lumen for the torque prescription of a bracket – including a passive Damon self-ligating bracket – to express itself (Figure 2).

Research that Pandis, et al., conducted demonstrates that Damon passive self-ligating brackets are equally effective in delivering torque to maxillary incisor teeth relative to conventionally ligated brackets. In fact, in the virtually friction-free environment of the Damon System, torquing movement from the angular rotation of a rectangular wire engaging opposing walls of the lumen on two points creates the desired torque without the friction from elastomeric ties or the flat sections of the wire being pressed firmly against the base of the slot as in conventionally ligated appliances. Active self-ligating brackets have similar

**Figure 2.** The torque prescription of a Damon bracket will express itself when only two edges of a rectangular archwire engage opposing walls of the lumen.

**Expanding Torque Options Without Further Expanding Inventory**

Besides employing the variable torques built into the Damon System appliance, there are other means of expanding torque options without expanding bracket inventories. One such means is to employ reverse torque.

When individual teeth have roots that are not upright under their crowns, treatment will progress more efficiently if you begin moving the roots toward their intended final position during the rectangular Copper Ni-Ti® leveling phase of treatment. If the variable torque options available will not achieve the root torque you want, employ reverse torque by inverting the bracket in the same arch to change the torque value from negative to positive or vice versa.

This case is an example of the most commonly employed use for reverse torque. As the light round wire aligns in such a case, the crown of the upper right lateral incisor will come forward, leaving the root in its palatal position. To combat this “pseudo-torque,” place an inverted +10° upper right lateral incisor bracket (now with reverse torque) to create a -10° torque bracket. Upon engaging the first rectangular wire, the root will begin to detorque and move labially toward its ideal position. With this protocol, you no longer need to await the major mechanics phase of treatment to correct the palatally positioned root. Once the root is in ideal position in relation to the crown, flip the bracket to its normal position and rebond (now with +10°) to ensure that the root does not continue to move labially. Note: When inverting brackets for reverse torque, be sure to keep the brackets on the same side of the arch so the root tip remains the same mesiodistal. See illustrations A and B. Placing them on the opposite side of the arch will change the intended root tip (mesial to distal and vice versa). By the way, we use the term "reverse torque" when discussing inverting brackets to minimize a patient’s fear that we’re placing a bracket upside down.

Inverting brackets changes torque from positive to negative or vice versa (in this case, on the upper right lateral incisor from +10° to -10°), which expands torque options and generates early root torque movement in the desired direction upon insertion of the rectangular wire. Case photos courtesy of Dr. Bill Thomas, Poway, CA.
frictional drawbacks of conventionally ligated brackets. Overcoming this friction requires high-force mechanics, which Damon System protocols are designed to avoid.

Prevent Torque Loss from Wire-to-Lumen Play and Major Mechanics: Add Wire Torque. There are two primary means of torque loss: wire-to-lumen play and major mechanics. Because the cross-section of a stainless steel working wire can never reach the same size as the lumen into which it is being engaged, a portion of the torque that is designed into the bracket will not be expressed. This loss of torque is often referred to as wire-to-lumen play and can have deleterious effects on the expressed torque, the axial inclination of teeth and ultimately the ability of the clinician to effectively finish treatment. For example, there is approximately +/-10.5º of play between a .019 x .025 stainless steel wire and a .022 slot (Figure 2). We all have to take wire-to-lumen play into consideration when planning torque values for ideal tooth and root positions.

Major mechanics (e.g., Class II elastics) also attributes to torque loss in maxillary anterior teeth. It is advisable to add torque selectively in the stainless steel wire during the major mechanics phase of treatment to counteract the negative effects of such mechanics. The loss of torque in the maxillary anterior teeth from wire play in combination with the Class II elastics can be easily offset by placing at least +10º (and up to +20º) of palatal root torque in the upper incisor region with the .019 x .025 stainless steel archwire.

Use Pre-Torqued Wires to Assist Torque Expression. Proper selection of variable torque bracket options will allow the rectangular leveling wires to provide torque delivery early in treatment. There are times, however, when the .018 x .025 Copper Ni-Ti archwire will not provide sufficient palatal root torque to the maxillary anterior teeth even with the ideal bracket torque. In these instances, it is often advisable to use a .019 x .025 pre-torqued Ni-Ti® (20º of torque) wire to assist in developing the ideal maxillary anterior palatal root torque. The pre-torqued wire can be used in place of a .018 x .025 Copper Ni-Ti archwire if the arch is sufficiently level, or it can be used as an additional leveling wire to ensure proper palatal root torque before progressing to the .019 x .025 stainless steel wire. In cases that require additional palatal root torque for the maxillary incisors, I often place a .019 x .025 pre-torqued Ni-Ti wire after the panorex/repositioning appointment if the repositioned brackets are level enough. In such instances, the additional palatal root torque will develop while the final leveling occurs prior to placing the .019 x .025 stainless steel working wire.

Essential #2 – Unlock the Malocclusion: Disarticulate the Arches with Bite Turbos

Clinicians who use bite turbos normally place them on the lingual surfaces of upper anterior teeth in deep-bite cases to bond both arches at once (Figure 3). As we’re all aware, bite turbos benefit treatment in numerous ways:
1. Protect the enamel from bracket wear / debonding.
2. Improve the effect of light wires on arch development.
3. Improve the effect of early light elastics for A/P, vertical and transverse corrections. See Essential #3.

4. May have an impact on correction of excessively low or high mandibular plane angles (brachyfacial or dolichofacial patients).

In my practice, a bite turbo has come to mean any resin bump that unlocks the malocclusion for greater freedom of movement. Using bite turbos more creatively, however, can have far-reaching treatment implications.

Bite turbos can also assist directionally in Class III cases. For such cases, I often form bite turbos (Mini-Mold starter kit, Ortho Arch, Schaumberg, IL) on the lingual surfaces of the lower incisors in such a way that they have an incline designed to allow the upper incisors to slide down it toward a Class I position. For all anterior bite turbos, I use Blūgloo™ two-way color change adhesive, which turns from clear to blue during bonding and debonding, making it easy to see during placement and removal. If the turbo debonds during treatment, the adhesive will turn blue, easing the patient’s mind that it is not a tooth fragment.

I try to select bite turbo locations to enhance the direction of the treatment goals. While this is an admittedly simplistic approach, I generally choose posterior bite turbos for high-angle cases and anterior bite turbos for low-angle cases. For example, in high-angle cases, using bite turbos in the posterior can cause intrusion of the posterior teeth that helps close down the high-angle. In low-angle cases, anterior bite turbos in conjunction with early light posterior vertical elastics will extrude posterior teeth and correct a low-angle deep bite by posterior eruption.

Dr. Stuart Frost shared his idea of using flowable resin to correct posterior crossbites when placing bite turbos in the anteriors is difficult (Figure 4). He flows a transparent pink resin (Triad® Gel Flowable, Dentsply, York, PA) into the occlusal grooves of lower first molars to make a flat plane, which fosters crossbite correction in conjunction with early light crossbite elastics by allowing freedom of interarch movement. The pink color of the resin makes the bite turbo easy to see during placement and removal and its transparency shows the occlusal surface through the turbo. Note: It may be necessary to air cool the Triad Gel because it warms up during the curing process.

**Essential #3 – Be Creative:**

*Use Early Light Elastics for Early Interarch Correction*

In combination with bite turbos, using light elastics where applicable (Figure 5) early in treatment to begin correcting A/P, vertical and transverse issues is yet another important tool that improves the quality and enhances the efficiency of Damon

### Figure 5. Light Elastics for Early Dental Base Movement

<table>
<thead>
<tr>
<th>Elastic Type</th>
<th>Size</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quail</td>
<td>3/16&quot;</td>
<td>2 oz</td>
</tr>
<tr>
<td>Parrot</td>
<td>5/16&quot;</td>
<td>2 oz</td>
</tr>
</tbody>
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**Figure 4.** Flowing resin into the occlusal grooves of lower first molars to make a flat plane fosters directional crossbite correction. Case photo courtesy of Dr. Stuart Frost, Mesa, AZ.

**Figure 6.** Early light elastics in this Class III case were worn from bonding day to improve the efficiency of treatment. Case photo courtesy of Dr. Bill Thomas, Poway, CA.
System treatment (Figures 6-8). Thanks to Dr. Tom Pitts (Reno, NV), who has been instrumental in devising this protocol, clinicians no longer have to wait for completion of the leveling stage before initiating bite correction. To determine the direction of early light elastics once the occlusion is unlocked with bite turbos, consider the ultimate treatment goals. If Class II correction is the primary concern, “shorty” Class II elastics will assist in early dental base movement. (See a discussion of “shorty” Class II elastics later.) If, in a low-angle case, an anterior deep bite is of greatest concern, posterior vertical elastics will help extrude the posterior teeth, thereby reestablishing the posterior

Figure 7. An anterior open bite has significantly improved in nine months with early light elastics. Case photos courtesy of Dr. Stuart Frost, Mesa, AZ.

Figure 8. This Class III case demonstrates remarkable progress achieved with the use of bite turbos placed lingually on the lower central incisors – which unlocked the occlusion and allowed the lower incisors to slide toward a Class I occlusion – in conjunction with early crossbite elastics. Case courtesy of Dr. Stuart Frost.
occlusion more expediently. If there is a combination of concerns about the malocclusion, consider combining the horizontal and vertical vectors, for example, by running posterior triangle elastics with a Class II vector. In summary, you can attach elastics in virtually any position that enhances the required correction. Figure 9 demonstrates three basic configurations. Types of elastics you should consider are posterior vertical box elastics, posterior triangle elastics, posterior check with Class II vector elastics, posterior crossbite elastics, shorty Class II or Class III elastics, and other anterior and posterior vertical elastics configurations or any combination of these.

“Shorty” Class II Elastics. Traditionally, Class II elastics run from the lower first molar to the post on the upper wire just mesial to the upper canine. The main concerns with placing Class II elastics in such a configuration early in treatment is that the horizontal pull would be so great that the elastics could cause extrusion of the upper anterior teeth or detrimentally affect the arch form if they are placed around the anterior curvature of the archwire. When using light early elastics on the initial leveling wires, it is important to reduce their horizontal pull to minimize any untoward effects on the ability of the wires to level the arches so different configurations are required.

The term “shorty” Class II elastics is used to differentiate their attachment from traditional Class II elastics because they have a reduced horizontal pull. Figure 10 depicts the configurations of “shorty” Class II elastics that clinicians have reported success in employing.

Conclusion
There are many decisions the Damon System practitioner can make in the treatment planning and early stages of treatment that will simplify the finishing stage of treatment and greatly improve the quality of case results. For the clinician looking to take their Damon System treatment to the next level, consider employing variable torque options, disarticulate the occlusion with bite turbos at the initial bonding and start light elastics for directional bite correction during the leveling phase of treatment. Using these three tools together will enhance the efficiency of Damon System treatment with a focus on clinical excellence.

References