Low Friction:
traditional mechanics: a perfect fit

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The orthodontic profession has three major technologies or trends that are evolving and offering new and exciting ways to practice according to the editor of the Journal of Clinical Orthodontics.[1] These are 3-D cone beam computed tomography (CBCT), mini implants or temporary anchorage devices (TADs) and low friction bracket systems. At the forefront of the orthodontic profession right now is the question of low friction systems or passive self-ligating bracket systems and how they may benefit the orthodontist. One needs to look no further than a recent issue of American Journal of Orthodontics to discover that low friction brackets are a hot button topic.[2] In this particular issue there were two impassioned letters to the editor expressing polar views on the topic. In fact, the editor of AJO, Dr. David Turpin, recently penned an editorial urging more in-vivo studies of self-ligation, low friction brackets and urged prudence when investigating these brackets. [3]

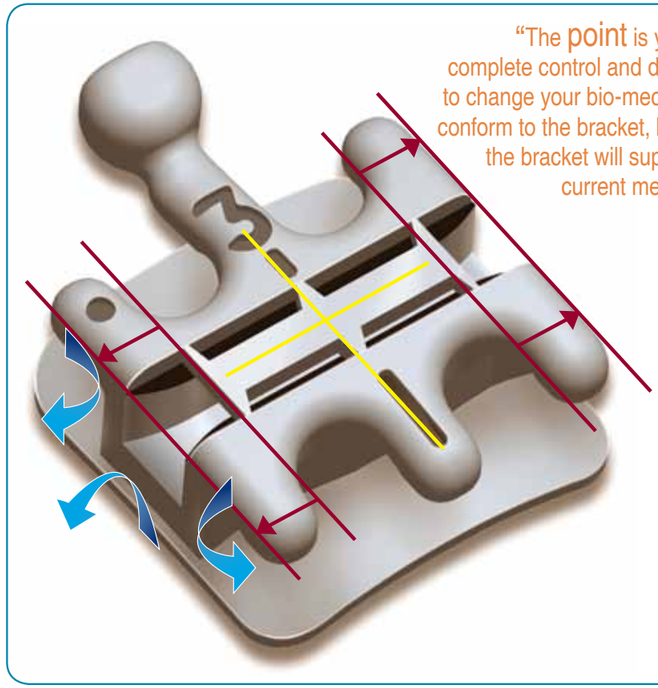
Why the interest in low friction brackets? Orthodontists are trying to minimize total treatment time, reduce the patient burden, expedite each adjustment appointment, increase appointment intervals while providing superior results and many doctors are examining the bracket system as a means to achieve these goals. This is nothing new. In the 1930s the Russell bracket was introduced and reported to do just that. This bracket would produce more comfort, fewer office visits, and shorter overall treatment time.[4] Other examples of the early self-ligation brackets were the Ormco Edgelok (1972), Forestadent Mobil-Lock (1980), Orec SPEED (1980), and A Company Activa (1986).[5] The self- ligation concept was given a big boost when Dr. Dwight Damon entered his namesake bracket in 1998 and has continued to enjoy a resurgence in popularity since that time.[6,7] The Damon system was interesting because it was a passive bracket that had a "fourth wall" (door) that was comparable to a buccal tube. There is another bracket on the market that is truly passive and acts like a buccal tube—Synergy R® from Rocky Mountain® Orthodontics. This novel bracket system has a removable cover over the arch slot on the cuspids, first bicuspids, and second bicuspids that enable the bracket to function similar to a buccal tube during the initial leveling and aligning treatment stages. However, Synergy R® differs from every passive self-ligating bracket currently on the market because it converts, while bonded to the tooth, to a traditional active bracket with full ligation capabilities for space closure and finishing during the later treatment stages.

Note the novel 6 tie wing design and hook. Note the rounded walls and funnel shape tube for easy entry of wire.

The wire is simply thread through the tubes on the 3s, 4s, and 5s. The central and lateral incisor brackets (Synergy® brackets) have a unique passive ligation system when an elastomeric tie is used, but the tie has minimal contact with the wire due to an intelligent design. Clearly, the Synergy R® bracket is the most versatile, active bracket ever. It gives complete control to the doctor to dictate active vs. passive forces, reduces friction dramatically, and total treatment time duration. Some of the highlights of the system include rounded arch slot walls to reduce binding and friction, and offers multiple ligation options—minimal friction ligation or conventional ligation, maximum rotation ligation or minimal rotation ligation.[8] The bracket has rounded slot walls and bosses on the bracket tie wings to minimize the possible contact surface with the arch wire and prevent the ligation force from exertion on the arch wire.[9]

Friction is typically the enemy in two areas of orthodontic treatment—leveling and aligning as well as space closure because frictional forces generated between bracket and arch wire have a significant effect on tooth movement.[10] The low friction bracket systems seek to reduce friction compared to conventional orthodontic bracket systems. There is evidence that these brackets offer lower frictional resistance (FR) values than conventional brackets when coupled with small round arch wires.[11,12] To reduce friction in the mouth some authors have recommended the use of low friction brackets, small initial wires, and less stiff wires.[13] The benefit of lower friction is more rapid alignment of teeth, quicker leveling of arches, and progression into bigger arch wires sooner in treatment. This allows the doctor to start anterior-posterior changes sooner, i.e., start using Class II elastics. The Synergy® system is unique in that it can be used with your current anterior-posterior mechanics: you can use a Wilson® Distalizing Arch, Pendulum, or any other distalizing arch. You can use other inter-arch mechanics such as a Forsus, Herbst, AdvanSync, etc. We have noted rapid treatment times for Class II cases when we couple the leveling and alignment efficiency of the Synergy R® with the concurrent Class II correction using AdvanSync. The point is you're in complete control and don't need to change bio-mechanics to conform to the bracket, but rather the bracket will support your current mechanics.

With lower frictional forces, the space closing phase of orthodontic treatment can be accomplished quite quickly. The Synergy R® bracket supports your current space closing technique. If you prefer to distalize canines into Class I with Energy



"The point is you are in complete control and don't need to change your bio-mechanics to conform to the bracket, but rather the bracket will support your current mechanics."

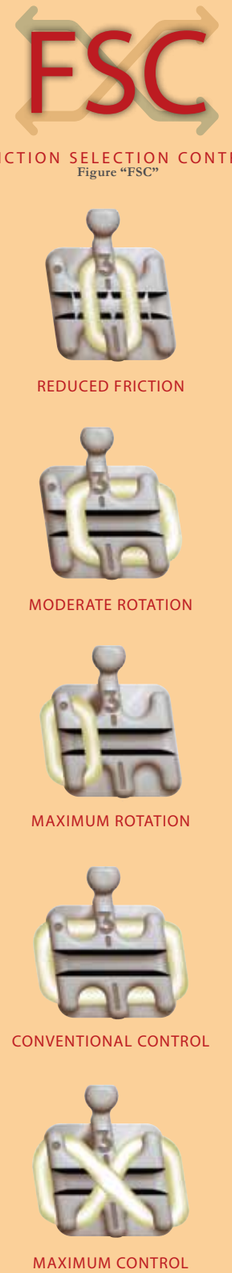


Figure "FSC"

Chain™, then that is exactly what you do with Synergy R®. The Energy Chain™ is placed in the same manner as you place it with a conventional bracket. If you like to distalize the canines into Class I using a Ni-Ti coil spring then that is exactly what you do with Synergy R®. The brackets have a hook in the middle of the bracket for easy access and bio-mechanic advantage. Once the canines are Class I and you want complete space closure you can chain 6-6 or you can place a crimpable hook on the arch wire and slide with a Ni-Ti coil spring. The low friction system lends itself to sliding mechanics and space closure is accomplished very quickly.

One concern with self-ligating systems is the loss of torque control, especially in the maxillary anterior. To many orthodontists, the desire to maintain careful 3D control of the maxillary incisors is a very important aspect of orthodontic treatment.[14] Enter the Synergy R® bracket. This bracket has the ability to allow the doctor to dictate the necessary friction in the maxillary and mandibular incisors. The clinician can dial in the bracket / arch wire friction to fit his / her specific treatment needs. If the doctor wants passive ligation in the anterior, that can be accomplished with the use of an elastomeric tie just around the center tie wings. If he / she desires more detailed rotation control, then he / she can tie only the mesial or distal tie wings. If the doctor wants complete 3D control of the bracket then the doctor can place the ligatures around all wings. This bracket system takes advantage of a completely passive system from the cuspids to the molars, but allows for more control in the anterior. This bracket offers some of the same advantages as a Giannelly bidimensional system without the bracket dimensions needing to be different. The bracket can be passive early in treatment, but can be made to have complete 3D control at any point in time.

As many orthodontists say, "It is not how you start the case, but how you finish the case." That is indeed the truth. The attention to detail in the finished cases is what separates us as specialists. Another concern with low friction systems is the inability to finish cases as desired. The Synergy R® has overcome this weakness of other bracket systems. Detailing and finishing of the orthodontic case is usually accomplished by either repositioning the bracket or placing bends into the arch wire. Synergy R® supports both methods. The bracket is very durable because it is manufactured using the Metal Injection Molding (MIM) process and gives the strongest appliance available. Thus, you can simply debond the bracket, clean the tooth, clean the bracket pad and rebond the same bracket into the desired position. If you prefer to bend the arch wire to finish and detail the case then you place the desired bend into the arch wire and you simply convert the 3, 4, or 5 brackets by removing the cap. You don't have to convert all the brackets, just the teeth where the bend is placed. After converting the bracket, the arch wire is tied in with an elastomeric ligature or steel ligature. In this manner you can utilize the passive, low friction benefits during the initial leveling and alignment phase and then you can finish the case with the detail you desire. This is a big advantage of the Synergy R® system.

Synergy R® Cap Remover Pliers - T01200

- Uses joint plier transer to shear off convertible caps effortlessly
- Easy access the buccal region with little obstruction
- Can be used on any convertible buccal tubes and convertible brackets

CASE 1

Patient presented with Class II division 2, deep bite, and retroclined incisors. The treatment plan was to level the Curve of Spee, align the teeth, followed by Class II elastics.

Note: Maxillary bicuspids
Maxillary retroclined incisors
Maxillary left lateral

Note: Mandibular rotations incisors
Mandibular rotations biscuspids

13 week follow up photos aligned with .018 x .018 arch wires. The patient was ready to proceed into the working mechanics phase of treatment.

CASE 2

Patient presented as Class I crowded with blocked out maxillary right cuspid and severe crowding in mandibular arch. Treatment plan was to open space for UR3 and level and align the lower arch.

At initial bonding note the blocked out maxillary cuspid and high irregularity in the lower arch.

After 12 weeks of treatment space had been created for the upper right cuspid and the lower arch alignment had improved dramatically.

CASE 3

Patient presented with a Class II malocclusion. The treatment plan was to bring the cuspid into the maxillary arch as quickly as possible. Then proceed into the working wires and initiate Class II mechanics. The low friction brackets aided in the vertical alignment of the high cuspid without impact to the other anterior segments.

After 12 weeks of treatment the vertical correction of the cuspid was almost completed without affecting other aspects of the arch form.

CASE 4

Patient presented with a Class II deep bite, posterior cross-bite, and rotations in the lower arch. The treatment plan was to correct the cross-bite with an RPE and then level and align the arches with Synergy R.®

After 12 weeks of treatment and expansion the mandibular bicuspids were improved.

CASE 5

Patient presented with a Class III tendency, open bite, and high maxillary left cuspid. The treatment plan was to bring the cuspid into occlusion without impact to the anterior segment.

After 15 weeks of using a low friction bracket, the cuspid was in occlusion, and the anterior segment 2-2 had not been negatively affected.

"Synergy R® can make all these things easier..."

In conclusion, I would like to comment on a patient that re-visited the practice recently and caused me to reflect on brackets. My office had seen this patient several years ago for an initial orthodontic consultation and the family elected to go with another orthodontist in the area. I had thought nothing more about the case until they recently showed up at my practice. The patient has been in appliances for over two years and there has been little progress. The patient was bonded with a leading self-ligating bracket and as you can see there has been minimal progress over the course of a two year treatment.

Two years of treatment- self ligating

Why do I bring this up? Because the bracket is not the doctor. The bracket can't diagnose, can't treatment plan, and can't treat the case. The patient should not be asking for a specific bracket, nor should the marketing of a specific bracket be the place of any practice. Even a fantastic bracket is worth little if the doctor lacks the knowledge or skill to treat the case. The bracket should be a tool to aid the doctor in accomplishing the goal of moving the teeth in a faster, easier, and more comfortable and convenient way. That is our job. We are still the doctor. Synergy R® can make all these things easier and can help treatment progress faster. Synergy R® can aid in the A-P, vertical, and transverse correction and Synergy R® can aid in the detailing and finishing of the case, but remember that you are still the doctor and every case still deserves the personalized attention to detail that Synergy R® can provide.

CASE 6

Patient presented with a Class II, division 2 malocclusion, deep bite, rotations, and a poor arch form. The treatment plan was to open the bite by leveling the Curve of Spee, improve the arch form using Synergy R, and then move into Class II elastics.

After 16 weeks of treatment, the arch forms were significantly improved and the patient was ready to move into working wires and Class II mechanics.

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"The bracket should be a tool to aid the doctor in accomplishing the goal of moving the teeth in a faster, easier, and more comfortable and convenient way..."

Synergy R®

a clinical pearl

Article written in by Travis Barr B.S. and Gary Holt D.D.S.

RMO®'s Synergy R® bracket System is a new and unique frictionless bracket system utilizing covered slots on all cuspids and bicuspids (figure 1) as well as a frictionless anterior ligature tie setup using Synergy R® brackets (figure 2). Synergy R® brackets offer a frictionless design without the hassle of doors while still providing patients with the much loved ligature colors at the later treatment stages. However, as with all new and improved technology come challenges. With the Synergy R® bracket the challenge is presented at the initial bonding, when placing the first archwire. As with most orthodontic cases, the interbracket mesial to distal distance can be very small, and/or have rotational angles that exceed 45 degrees, and/or have a height difference of several millimeters (figure 2). Using Synergy R® brackets to treat these cases works well when full wire engagement in the brackets occurs. Complete wire engagement in Synergy R® brackets requires the "threading" of the wire between and through each bracket (figure 2).

In this article we describe a technique that utilizes the natural flexibility of Ni-Ti to fully engage the archwire. This technique results in complete expression of the wire and best utilizes the frictionless environment provided by Synergy R® brackets.

"Synergy R® brackets offer a frictionless design"

Figure 1. Shows the slot and slot cover for the RMO Synergy R® bracket.

Figure 2. Example of full arch wire engagement using Synergy R® brackets. Also shows the slotted cover on cuspids/biscupid brackets as well as the frictionless anterior lateral to lateral setup.

Procedure

Starting the wire sequence with a .014 Thermaloy® Plus archwire is preferred for the material property benefits. The .014 Thermaloy® Plus wire works well due to its flexibility, ability to regain its initial shape after placement, and adequate force level.

The focus of this technique is wire insertion/threading through cuspid and bicuspid brackets, because the greatest challenge is to "thread" the wire from 1st to 2nd bicuspid, and/or from 2nd bicuspid to 1st molar. The following four-step sequence describes this process:

Step 1. Push the wire through the bracket until you can see it coming out the distal part of the bracket.

Step 2. Place a scalar on the distal part of the bracket behind the wire and grab an anterior part of the wire with a Hemostat.

Step 3. Push the wire buccally with the scalar while simultaneously pushing distally on the wire with the Hemostat. This will allow the wire to come through the slot. Push an ample amount of wire through; this will be your working wire. Usually the length of two bicuspids is enough.

Step 4. Grab the wire with the Hemostat and thread it through the next tube. The wire will curl back around on itself. The extra wire allows for flexibility and if the wire is damaged during this step you can remove the damaged area.