A Comprehensive Cephalometric Analysis

FAQ - e-ceph® Web RMODS®

THE FUNCTIONAL MATRIX
a practical solution using
THE MULTI - FAMILY

Synergy R®
a clinical pearl
A Road Map to the Future

Rocky Mountain Orthodontics, located in Denver, Colorado, is The World's Oldest Synergistic, Bioprogressive, Breathing Enhancement Orthodontic Company.

RMO® was founded in 1933 by Colorado orthodontist Dr. Archie Brusse. The last 55 years was led by Martin Brusse whose vision was dedicated to developing continued education and future appliance systems in pursuit of promoting vital oral health for every patient. RMO® remains privately owned and maintains a rich history deeply rooted in Denver culture.

Martin Brusse realized his goals in two very special and capable people he confidently selected to continue guiding RMO® into the future, Tony Zakhem and Jody Hardy.

Rocky Mountain Orthodontics proudly supports the local community and is honored to design, engineer, and manufacture its premium quality orthodontic products with pride in the U.S.A.

RMO® is proud to be recognized as the longest-running exhibitor at the AAO. Since the company’s inception, Rocky Mountain Orthodontics has pioneered numerous orthodontic breakthroughs such as pre-formed molar bands and the metal-injection-molding process.

RMO®’s innovations have continued with orthodontic advancements such as RMODS® and e-Ceph® computer aided diagnostic services, interceptive pediatric appliances, and the Straight Wire Low Friction system which includes RMO®’s patented Synergy bracket line, the Dual-Top temporary anchorage device system, and the RMbond® Indirect Bonding system.

RMO® is dedicated to developing Continuing Education programs designed to enhance and expand clinicians’ knowledge of various systems, appliances, and biomechanics. RMO® Seminars are conducted throughout the year and around the world with lecture specialists trained in multiple disciplines.

With a world-wide distribution network, a subsidiary division in Europe, and a joint venture operation in Japan, RMO® is truly a global manufacturer. Rocky Mountain Orthodontics has been awarded twice with The President’s distinguished “E-Star Award for Exports” by the U.S. Secretary of Commerce “For continued outstanding contributions to the Export Expansion Program of the United States of America”. In addition, in 2008 RMO® was awarded the Governor Award for Excellence in Exporting.

Many of RMO®’s great developmental strengths come from valued relationships and the exchange of oral health concepts, innovations, and educational information. Combined, this process allows RMO® to service customers around the world with progressive Synergistic System treatment solutions.

“RMO® is proud of our heritage, history, and legacy. Tony and Jody have recently completed the formation of an entirely new executive management team that will guide the next generation as we move towards the future.”

Back Row: (Left to Right) Frank Augustine, Jeff Smith, Adam Pollack, Hugh Carr
Front Row: Jody Hardy, Tony Zakhem
Low Friction: traditional mechanics: a perfect fit

Dr. Gary Holt graduated Magna Cum Laude from the University of Maryland Dental School and then completed his orthodontic residency at the University of Missouri-Kansas City. He has completed the training to be Dawson Level I certified. His interests are efficient treatment with attention to detailed occlusion, the use of TADs to improve treatment time and effectiveness, and the use of Diode Lasers in the orthodontic practice. He has completed three Ironman races and lives in Littleton, CO with his wife and three children.

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. 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 doctors to change their bio-mechanics to distalizing Arch, Pendulum, or any other distalizing arch. You can use other inter-arch mechanics such as a Fonsus, 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 lateral incisor brackets (Synergy® R 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 this 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.2 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.3 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.4 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.6,10 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® R 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 Fonsus, 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.
One concern with self-ligating systems is the inability to finish cases as desired. The bracket 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 he / she wants passive ligation in the anterior, that can be accomplished with the use of an elastomeric ligature. The clinician can dial 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.

One concern with self-ligating systems is the loss of torque control, especially in the anterior segment. 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 rebind 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.

CASE 1
Patient presented with Class II division 2, deep bite, and retruded incisors. The treatment plan was to level the Curve of Spee, align the teeth, followed by Class II elastics.

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

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.

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 mechanics 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 arch 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.
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 of 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 booked 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

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.

Why do I bring this up? Because the bracket is not the doctor. The bracket can't diagnose, can't treat, 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 detailing and convenient 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.

Synergy R® brackets offer a frictionless design

RMO® Synergy R® bracket System is a new and unique frictionless bracket system utilizing covered slots on all cusps 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 challenges. With the Synergy R® bracket System utilizing covered slots on all cusps and bicuspids, because the greatest advantage of the bracket is the elimination of friction, the bracket becomes much more of a challenge to install. The focus of this technique is wire engagement and convenience. The .014 wire engagement and self-ligating bracket designs using nickel-titanium archwires have gained popularity in the last few years. The .014 wire is the industry standard for many reasons. The .014 wire can provide 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.

Procedure

Starting the wire sequence with a .014 Thermaflex® Plus archwire is preferred for the material property benefits. The .014 Thermaflex® 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 cusp 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 scaler 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 scaler 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. Grasp the wire with the Hemostat and thread it through the slot.

References

Discussion

This simple four-step procedure works well in most cases to allow full wire engagement in the most difficult bracket placements (figure 3). However, if there is less than 2 mm interbracket distance, the technique is not as effective. This is due to either not having enough wire flexibility to complete the threading or not having enough free movement to allow the torque built up in the wire twisting to be released. A semi-permanent curl can result in the wire (figure 4) until more room is available.

Another challenge that occurs at initial bonding is when the distal bracket slot is pressed against the adjacent tooth, not allowing room for the wire to slide through the slot. This can easily be overcome with bracket placement and a reposition later in treatment.

Conclusion

By following a simple procedure, full arch wire engagement is achieved in Synergy® brackets unless there is an extreme case of anatomy misalignment. The full functionality of the frictionless Synergy® bracket system is expressed at the initial bonding.

Features and benefits include:

- cuspid and bicuspid brackets feature an integrated convertible cap
- can reduce treatment time and appointment intervals
- no moving parts—no broken clips, doors, or slides
- large flared lead-ins reduce kinking and binding
- low profile—comfortable for your patient
- convert to a standard Synergy®-style bracket at any time for advanced FSC® modes

SWLF Synergy® provides minimal friction and rapid wire change-out, with cuspid and bicuspid brackets that can be converted into traditional Synergy®-style brackets at any time during treatment. Clinically tested and proven effective, SWLF Synergy® is designed, engineered, and manufactured with pride in the USA.
Orthodontic treatment faces many obstacles that can be directly related to existing excessive disharmonies of the dental and skeletal components. These disharmonies can be further compounded by aberrant dento-facial growth. Diagnosis of such discrepancies, as well as forecasting facial growth, prior to initiating treatment, can alter the orthodontist of what problems to expect during treatment.

The orthodontist’s treatment plan is only as good as the quality of information derived from the diagnostic records. Performing a proper diagnosis is essential to good treatment planning. Without a proper and thorough diagnosis, treatment planning is at best a guess. Only the naif clinician utilizes a handful of cephalometric measures or a single appliance to correct all malocclusions. Diagnosis is derived from the Greek word for knowledge. We can only diagnose from what we have learned. We must understand the dentofacial skeleton, recognize normal from abnormal, and the limitations of treatment planning for children and adolescents could be improved. In 1970, Sassouni Plus. Upper Airway obstruction is evaluated utilizing six different measurements devised by Handelman and Osborne, Linder-Aronson and Hendrickson, and Schulz.

Individualized norms are provided not only based upon age and gender, but also upon ethnic heritage. Utilizing the Visual Treatment Objective (VTO): (short and long term) with arch analysis of upper and lower dentition, assists in orthodontic treatment planning. The RMODS® system provides a visual blueprint of recommended dental and skeletal changes specific to each patient.

Each work-up is designed with the orthodontist’s treatment preferences concerning extraction, convexity change, esthetics, limits of tooth movement, and mechanics. Long range growth simulation to maturity with and without treatment aids the orthodontist in predicting the treatment outcomes. Because of the method of long-range growth prediction, the probability of third molar eruption can be predicted within 90% accuracy and can prepare the patient for future removal.

"RMODS® comprehensive analyses have aided me in diagnosing upper airway obstructions, abhorrent growth patterns, and endochondronal problems. Long range growth simulations have also helped me to inform my patients and their parents about the probability of orthognathic surgery.”
Case Study I
Airway Obstruction and Poor Facial Growth Patterns

Mouth breathing has been identified as a cause for a number of orthodontic problems including cross bites, low tongue positions, and vertical dysplasia.13,14 Children who have a genetic predisposition towards a narrow, dolichocephalic facial pattern, and having airway compromise are particularly at risk to developing long face syndrome. Moreover, children with a genetic propensity to developing mandibular prognathism, possessing tonsillar hypertrophy and who are chronic mouth-breathers are at particular risk for developing advanced mandibular prognathism.16

Mouth breathing should also be regarded as an obstacle to successful orthodontic treatment and is likely to result in orthodontic relapse if not treated. It is imperative that the existence of mouth breathing, as well as its etiology, be recognized as soon as possible and ideally before orthodontic treatment has been attempted. Since anteroposterior and vertical dentoalveolar discrepancies are linked to growth, interceptive measures should be initiated around age seven. To wait until age 12, when 90% of normal dentofacial development will be restored while the original chronic mouth-breathing habit is “unlearned”.15

Ricketts described a condition associated with upper airway obstruction; he labeled it the Respiratory Obstruction Syndrome.19 Clinically, Ricketts found the following characteristics generally associated with the presence of enlarged adenoids and tonsils:

- Unilateral or bilateral cross-bites
- Tonsil or adenoids present or history of respiratory problems
- Open-bite
- Tongue thrust upon swallowing
- Mouth breathing
- Functional cross-bite with deflection of the mandible to one side or possibly deflected anteriorly producing a pseudo-Class I condition.

Many orthodontists are surprised to learn that the size of the adenoid, tonsil, and nasopharyngeal airway can be evaluated on the lateral cephalogram. Linder-Aronson and Henrickson9, Schulhof12, Handelman and Osborne13, and Ricketts19 have all devised airway measurements of adenoidal enlargement relative to the nasopharyngeal airway. Radiographic analysis in the lateral and posteroanterior aspects provides a systematic means of evaluating airway dimensions, the morphogenetic factors affecting lower facial heights, bimaxillary growth characteristics, and vertical facial growth characteristics are the most significantly impacted by mouth-breathing.20

RMODS® uses the Schulhof12 analysis of adenoid enlargement which includes the two linear measurements by Linder-Aronson and Henrickson9, a linear measurement by Ricketts19, the airway percentage in an epipharyngeal trapezoidal area described by Handelman and Osborne13, and the craniofacial angles N-S-Ba and BA-S-PNS. RMODS® analyses every case for the potential adenoid obstruction of the mesopharyngeal airway. Adenoid blockage of the mesopharyngeal airway is deemed to be present if three or more measurements are one or more standard deviations from the norm.21 If the patient is a mouth breather and the analysis indicates that the adenoid is too large for the airway,22 the orthodontist can make a referral to an otolaryngologist for further evaluation and appropriate treatment.

This case is a good example of upper airway obstruction and a poor facial growth pattern:

She had a history of snoring, mouth breathing, food allergies, and asthma. Her comprehensive cephalometric analysis demonstrated the following:

1. Class II canine
2. Severe skeletal Class II due to both jaws
3. Skewed open bite due to mandible
4. Possible excessive mandibular growth
5. Adenoid blockage of the airway
6. Skewed incisor cross bite pattern due to mandible
7. Mandibular arch wider compared to maxilla
8. Possible low tongue position

Because of her short porion location, high cranial base deflection and forward nasomental position, she is more likely to grow a lower jaw that is too large relative to the upper face. As a result of the upper airway obstruction and poor growth characteristics, this patient was referred to an Otolaryngologist for evaluation of upper airway obstruction. The tonsils and adenoids were removed prior to the start of orthodontic treatment. Following maxillary expansion with a bonded RME (Rapid Maxillary Expander), the upper and lower arches were leveled and aligned.

Diagnostic Intraoral Photographs
The following progress records were taken after 24 months of treatment, prior to banding the second molars and Class II correction. This patient no longer snores and her respiration is now nasal. Note that her low tongue position and forward head posture to open her airway has improved. Her dental overbite has been maintained.

“This patient no longer snores and her respiration is now nasal.”

Case Study II

Frontal Analysis

The frontal cephalometric analysis is often overlooked by most orthodontists. Asymmetries, dental cross bites, skeletal cross bites, maxillary and mandibular dental arch widths, nasal widths, turbinate enlargement, deviated nasal septums, and facial proportions can all be evaluated from the posteroanterior cephalogram. Many orthodontists think of the maxilla as being the only culprit of dental or skeletal lingual cross bite patterns. However, many times the width of the mandible can be the major contributor to skeletal lingual cross bite patterns.

Dental compensations can hide overt hypo-plastic maxillary and hyper-plastic mandibular transverse discrepancies. Rapid maxillary expansion can improve skeletal lingual cross bite patterns, but without a posteroanterior cephalogram, it is impossible to diagnose them. The affect of the excessive mandibular width may not be clinically evident until late adolescence, when rapid maxillary expansion may be more difficult. Taking a posteroanterior cephalogram on patients is simple and the benefits to the patient are immeasurable. Furthermore, with the development of cone beam computed tomography, all patients that have a CBCT scan will have both lateral and frontal images readily available for analysis with a single scan.

This patient presented with a Class I malocclusion, a tendency for a skeletal open bite, possible ectopic lower jaw growth and a significant arch length discrepancy with ectopic maxillary canines.

Cephalometric analysis also revealed a skeletal lingual cross bite pattern due to both the maxilla and mandible as well as possible ectopic mandibular growths.

This patient’s treatment plan included rapid maxillary expansion and fixed appliances. The result was a nicely treated Class I occlusion.
Superimposition of the initial vs. the final lateral cephalometric analysis demonstrates both significant horizontal and vertical mandibular growth, as predicted in RMODS® initial comprehensive analysis.

Superimposition of the initial vs. the final frontal cephalometric analysis on the occlusal plane shows improvement in the cant of the maxilla. Rapid maxillary expansion of the maxilla has also successfully corrected the skeletal lingual cross bite pattern and eliminated dental crowding, demonstrating the logic in a non-extraction treatment plan.

Superimposition of the current lateral cephalometric tracing over the growth to maturity without treatment demonstrates probable significant growth of both jaws, especially the mandible. However, despite the mandibular growth, the class II molar relationship does not improve without treatment. Treatment designed to take advantage of the remaining mandibular growth, while maintaining upper molar position would be of advantage to improve the class II malocclusion.

RMODS® computer performs growth simulations by combining the following four growth curves with individual average directions and amounts of change per year for approximately 200 cephalometric landmarks.

These four different growth curves are:
- Total body height
- Soft tissue
- Cranial base
- Mandibular growth

Each curve is subdivided by race, gender, and skeletal age (this final subdivision is used to classify which patients are normal growers vs. late and advanced growth categories). When treatment planning for a growing patient, it is important to consider how much growth will or will not occur within the treatment time. Skeletal age can be extremely valuable in determining remaining growth in late adolescence. Moreover, the most significant factor in evaluating growth is not absolute amount, but relative amount. It is important, that the relative growth of the maxilla and mandible be normal. Deviations of growth between the jaws within 20% can generally be tolerated, but those deviations greater than 50% will result in a considerable deformity.

Long Range Growth Forecasting (CASE III, CASE IV, CASE V, CASE VI)

As previously stated, the ability to forecast the facial growth of a patient to maturity is of great benefit. Regardless of how thorough a cephalometric analysis is devised to evaluate a growing patient’s present state, that technique will be insufficient for treatment planning because of future growth and demofacial development. Incorporation of craniofacial growth into the method of diagnosis can only result in improved treatment planning. The craniofacial relationships seen even two years after the start of treatment in a growing child may not be the same at maturity. A case treated to suitable balance at age 12 may prove to be a failed result at age 25 due to continued growth. This is especially true in those patients that demonstrate abnormally large amounts of lower jaw growth during their late teenage years and early twenties.

This patient presented with the following problems:
1. Class II malocclusion due to the upper first molars
2. Severe Overjet
3. Severe Class II Skeletal Malocclusion due to the mandible and maxilla
4. Open Bite
5. Tendency for Skeletal Open bite due to the mandible and maxilla
6. Wide mandibular arch compared to jaw
7. Midline asymmetry

Superimposition of the current lateral cephalometric tracing over the growth to maturity without treatment demonstrates probable significant growth of both jaws, especially the mandible. However, despite the mandibular growth, the class II molar relationship does not improve without treatment. Treatment designed to take advantage of the remaining mandibular growth, while maintaining upper molar position would be of advantage to improve the class II malocclusion. An orthodontist has more control over the dentition than the skeletal component.

Case Study III

Diagnostic Panoramic Radiographs

Diagnostic Intraoral Photographs

Diagnostic Panoramic Radiograph
This patient was treated with rapid maxillary expansion, straight-pull headgear and fixed appliances during Phase I treatment. Superimposition of the initial lateral cephalometric analysis upon the progress cephalometric analysis, prior to initiation of Phase II treatment, shows significant improvement to a Class I molar relationship. The upper molar position was maintained within the maxilla, forward movement of the lower molar and growth of the mandible helped in the correction of the class II malocclusion.

Superimposition of the retention frontal analysis upon the visual norm demonstrates that rapid maxillary expansion during Phase I treatment reduced the probable skeletal lingual crossbite pattern due to additional mandibular transverse growth.

These four different growth curves are:

- Total body height
- Soft tissue
- Cranial base
- Mandibular growth

“The RMODS® computer performs growth simulations by combining the following four growth curves.”
Until recently, most diagnostic systems were located and maintained in-office and the practitioner was responsible for upgrades, upkeep and maintenance.

Today, e-Ceph® Web can deliver the latest orthodontic diagnostics right to your web browser!

e-Ceph® Web provides an easy two step process for sending patient data and getting diagnostic results. Step one enables users to digitize x-rays directly through their web browser, or to submit files of patient records to our analysts for evaluation. Step two allows you to receive your results through the same web interface.

So now you can enjoy the thoroughness and accuracy of the RMO Data Service combined with the convenience and flexibility of an in-office system.

The e-Ceph® Web diagnostic workup delivers the same quality you’ve come to expect from us.

Case Study IV

This is the case of a Class II malocclusion with the potential for excessive lower jaw growth. Superimposition of the lateral cephalometric analysis upon the growth forecast reveals a skeletal lingual cross bite pattern due to the maxilla and the mandible.

Superimposition of the initial cephalometric analysis upon the progress cephalometric analysis demonstrates forward growth of the mandible, as forecasted.

The frontal cephalometric analysis reveals a skeletal lingual cross bite pattern due to the maxilla and the mandible.

Growth to Maturity without Treatment

The growth forecast also illustrates no improvement in the Class II malocclusion, further upright of the lower incisors and deepening of the bite without orthodontic treatment. Maintaining upper molar position and taking advantage of future mandibular growth will aid in orthodontic correction.

Superimposition of the initial frontal analysis upon the progress frontal analysis.

This patient now has a nice final Class I occlusion with the help of the growth prediction.

Diagnostic Intraoral Photos

Retention lateral cephalometric analysis
Case Study V

This patient presented with a Class II malocclusion. The growth forecast to maturity demonstrated strong lower jaw growth in a horizontal direction. Maintaining the upper molar position and allowing for the forecasted lower jaw growth will help in correcting the class II malocclusion.

Wilson® 3D®

The Wilson® 3D® system comprises a series of interrelated fixed/removable intraoral modules that simplify and improve treatment. Wilson® 3D® appliances can be used to supplement all techniques while delivering practical and simple solutions to both typical and extraordinary movement challenges. RMO® sponsors numerous CE events that teach the skills needed to incorporate Wilson® 3D® concepts and materials into your present technique. Please call RMO® or visit our website for additional information about the legendary Wilson® 3D® system.

- Time tested and proven
- Over 100 different movements possible, including: expansion, contraction, distalization, space maintenance, bilateral, and unilateral
- Does not replace your current technique – the Wilson® system simply complements your current system
- First phase, early treatment, mixed dentition, and adults
- Preconfigured sizes to fit all patient dental ranges
- Fixed for the patient and easily removable by the clinician for rapid chairside adjustments

For more information, please call 800.525.6375 or visit our website at www.rmortho.com.
Case Study VI

The following patient had a severe Class III malocclusion.

Superimposition of the initial lateral cephalometric analysis upon the growth to maturity forecast demonstrates the potential for significant additional mandibular growth. Treatment designed to address this possible excessive growth will improve overall treatment success.

Superimposition of the progress lateral cephalometric analysis upon the initial cephalometric analysis demonstrating how early treatment involving fixed appliances along with the growth forecast aided in improving this patient's malocclusion.

Superimposition of the lateral cephalometric analysis upon the visual norm illustrates the significant mandibular prognathism.

Superimposition of the initial frontal analysis upon the visual norm

Diagnostic intraoral photos

Progress photos

Progress Panoramas
References


22. RMODS Course Schedule, 1989

Superimposition of the initial cephalometric analysis with the retention analysis shows good control of growth with treatment. The final result was a Class I occlusion.

Superimposition of the initial frontal analysis upon the retention frontal analysis

Retention Photos

Retention i-CAT® panoramic report

Final lateral cephalogram and lateral cephalometric analysis
WHY INDIRECT BONDING?

RMO’s RMBond® Indirect Bonding system provides clinicians a simple and consistent solution for maximizing practice efficiency. The RMBond® Indirect Bonding (IDB) system delivers a step-by-step process that allows doctors to fundamentally reduce the amount of chair time involved when bonding appliances to a patient. This results in a greatly improved patient experience also, as the IDB process significantly reduces the patient’s chair time and discomfort during bonding. The RMBond® system allows for extremely accurate bracket placement under convenient setup conditions working on a study model, and most of the procedures can be conducted by staff persons with modest training. The RMBond® start-up kit is a turnkey system that includes all of the materials necessary to begin Indirect Bonding your patients immediately.

UNIQUE COMPONENTS IN THE RMBond® INDIRECT BONDING SYSTEM INCLUDE:

RMBond® INNER TRAY MATERIAL:

• Provides predictable and reliable working time, with excellent flow characteristics for complete encapsulation of appliances
• Clear material visibility during bracket transfer assures accurate seating and rapid light curing
• Provides an ideal tear strength when removing Inner Tray Material - no debonds and minimal cleanup
• Eliminates the need for block outs around hooks and undercut

RMBond® LC FLOWABLE ADHESIVE:

• Precise dispensing system with needle tip
• Ideal viscosity
• Reduces flash
• Excellent bond strength

SYSTEM HIGHLIGHTS

• Reduces chair time
• Significantly more comfortable bonding experience for patient
• Convenient and more precise final appliance placement on a study model at doctor’s leisure
• Reduces clinician neck and back pain by minimizing time bent over a patient during bonding procedure
• No need for two models – study model also functions as IDB model

Precise bracket placement on a study model
Transfer tray fabrication - Inner Tray Material fully encapsulates all appliances
Rapid patient bonding process - light curing directly through transfer tray
Dr. Budi Kusnoto is a tenured full time associate professor in the Department of Orthodontics, University of Illinois at Chicago. His computer science background and knowledge in biomechanics as well as management of craniofacial deformities are complimentary to his research in the field of orthodontic diagnosis and treatment planning. He also has been actively involved in clinical research in the area of temporary anchorage devices, invisible orthodontic appliances, computerised orthognathic craniofacial surgical imaging, 3D imaging-computerized treatment simulation, and longitudinal digital data mining project. Currently Dr. Kusnoto also maintains a private practice and clinic directorship at the Department of Orthodontics, College of Dentistry University of Illinois at Chicago. He is an active member of American Dental Association, Illinois Society of Orthodontists, Chicago Dental Society, American Association of Orthodontists, and is a Diplomate of American Board of Orthodontics.

Dr. Kusnoto has been using RMODS® services for the past 5 years for his research in validating computerized cephalometric prediction treatment outcome; he is also constantly involved in evaluating many other cephalometric imaging software in the market.

Q: Can you provide us with an overview of RMODS® and e-ceph® Web?
A: e-ceph® Web can be summarized as a web-portal with a virtual meeting place to various cephalometric analyses, growth simulations, data/image management, and case management tools to aid in developing excellent treatment objectives/plans. It can also be a web-portal for potential inter-institutional as well as inter-clinician world wide exchange of study cases.

Q: Why use e-ceph® Web?
A: e-ceph® Web is purely web based, meaning it is not installed on a computer. It is easily accessible through any terminal connected to the Internet. No updates or maintenance will ever be needed, as this is done automatically through the e-ceph® Web RMODS® server. All data can be securely stored on the RMODS® server facilities and are easily accessible from anywhere on the planet with a high speed Internet connection.

Q: What different types of analyses does e-ceph® Web offer?
A: e-ceph® Web offers the same cephalometric tools and analyses as the RMODS® service, Ricketts, Downs, Steiner, Sassouni Plus, and Jarabak.

Q: Is there tech support available?
A: Yes, well trained analysts and technical support is available Monday through Friday during business hours.

Q: What is a Visual Norm?
A: A - e-ceph® Web is one of the extremely few cephalometric software programs currently available in the market that has the ability to accurately produce a Visual Norm (graphical representation of a NORM) which can be used as a template while treating the case (to guide clinicians in designing their orthodontic mechanics to move teeth/bone in space).

Q: What is the benefit of e-ceph® Web?
A: e-ceph® Web functions as cephalometric digitizing software, and also gives you the flexibility of being able to send your records directly to RMODS® where well trained and highly experienced personnel will digitize them and return the results to you.

Q: What if I don’t have time to digitize my case?
A: If you would like the RMODS® analysts to digitize your case, you can simply click on the “PROCESS by RMODS®” option after uploading all the necessary radiographs/digital images and patient information into the e-ceph® Web system. The final result will be sent back to you by email.

Q: Why do I need to digitize the lower arch and what kind of information will it provide me?
A: Digitizing the lower dental arch will give the clinician much more information about occlusion, tooth size discrepancy, dental development as it relates to the skeletal and facial structures which were derived from lateral and frontal cephalometric radiographs. The digitized information from the lower arch is required by the RMODS® program to produce the treatment planning segments of the results. It provides a 3rd dimension of the view of the patient.

Q: How long does it take for me to receive my results?
A: On average results will be returned within 3-5 minutes, depending on the complexity of the analysis requested and Internet speed. If you have submitted your records to RMODS® for the analysts to digitize, results should be returned within 3 days.

Q: Why do I digitize the upper arch and what kind of information will it supply me?
A: By adding the upper arch you will be provided with the Bolton Analysis as well as a more complete view of the patient’s current situation.

Q: Is there a web-portal for potential inter-clinician world wide exchange of study cases?
A: It can also be a web-portal for potential inter-clinician world wide exchange of study cases.

Q: Why use e-ceph® Web?
A: It is the only cephalometric analysis software in the market that can actually produce interpretation of the cephalometric numbers and its parameters which can lead to formulating treatment objectives, thus coming up with suggested treatment plans and treatment mechanics including treatment sequence and timing.

Q: How is e-ceph® Web better than the software that I would have in my office?
A: e-ceph® Web functions as cephalometric digitizing software, and also gives you the flexibility of being able to send your records directly to RMODS® where well trained and highly experienced personnel will digitize them and return the results to you.
The Multi-Family Appliances are an integrated system of appliances that allow the orthodontists to choose the ideal appliance according to the age and the malocclusion of the patient.

INTRODUCTION

A long-term goal in orthodontics has been to understand the interaction between the Functional Matrix and malocclusion. Research in this area began in the early 19th century and, to date, there is no definitive understanding. Contemporary orthodontics recognizes two opposing views. The “functionalists” believe that the Functional Matrix, especially that of a muscular nature, is the determinant principle of malocclusion. Contrary to this belief is the “mechanistic” view, whose proponents say that muscular dysfunctions are a result of malocclusion. Unfortunately, the latter have yet to submit a theory on the etiology of malocclusion. There are various positions between these two extremes that, to a greater or lesser degree, recognize the influence of the functional matrix on malocclusion. It is difficult for the clinician to address malocclusion both in etiological terms and long-term stability. A primary issue is the probability of relapse after orthodontic treatment. If the Functional Matrix is the cause of malocclusion, and it is not neutralized during treatment, there will be a greater possibility of relapse. However, if the dysfunction is a result of the malocclusion, only its complete resolution will guarantee stability of the case. From our perspective, this ideological dualism is irrelevant.

The philosophy of “Self Confident Orthodontics” views the interaction between the Functional Matrix and malocclusion as a continuous exchange of information between the two components and, therefore, forces a therapeutic protocol that aims at correcting both parts of the system in order to find the most appropriate solution for long-term stability. The main therapeutic idea is to work on each component at a different treatment time. In the absence of definitive scientific evidence, the clinician must develop his/her own viewpoint and objectives to best resolve the patient’s problems and reach a clinical outcome that will be stable over time.

Our therapeutic protocol calls for a three-step treatment sequence to address the Functional Matrix:

1. Preparation Stage: use myofunctional orthodontics at an early age, from 4-5 up to 10-12 years of age, while waiting for the appropriate time to start treatment with conventional orthodontic mechanics.
2. Treatment Stage: use myofunctional appliances in association with conventional fixed appliance therapy.
3. Retention Stage: use myofunctional orthodontics at the end of treatment to promote adaptation of the Functional Matrix to the new occlusion.

This approach is based on simple considerations. If alterations of the Functional Matrix are the cause of malocclusions, its neutralization guarantees simpler active treatment. If, however, the dysfunctions are the result of a malocclusion its treatment will be more complex; therefore, neutralization of the Functional Matrix would allow faster and more simplified treatment. Lastly, if the resolution of the malocclusion is decisive for correction of the dysfunction, control during active treatment allows a quicker adaptation of the Functional Matrix to the new occlusion. Therefore, the guideline is to act on both components without certain knowledge of which is the cause and effect. Simplified therapeutic protocols will produce a better and more stable result.

Based on these concepts we have tried to find a solution to patient treatment with a simple, economical, and easy to use myofunctional approach that can be utilized at any age and at all stages of orthodontic treatment.

The appliances of the MULTI SYSTEM respond very well to these characteristics and therefore are included in the “Self Confident Orthodontics” philosophy of treatment.
Multi-S, Multi-T, Multi-P are designed to be used independently of other orthodontic devices. As part of their design, dental tooth eruption/positioning guides are included as innovative additions to the orthodontic appliances. The extent of the guide varies among the appliances to follow the development of tooth eruption with age. Multi-T contains a guide only for the incisors; Multi-T/M contains guides for the incisors and canines; Multi-P has additional guides for premolars. Multi-T/M, was designed to be used in combination with conventional orthodontic treatment, and therefore does not have any dental guides.

The COMMON CHARACTERISTICS OF MULTI SYSTEM APPLIANCES

Like all myofunctional appliances, these have a monoblock shape in order to simultaneously work on both dental arches. The mandibular position promotes with respect to a edge to edge incisor position. Moreover, the appliances have a raised occlusal plane. This positioning promotes an immediate mechanical unlocking of the TMJ in association with the functional unblocking of muscles.

In addition, all of the appliances have a large vestibular shield which serves to activate the perusal muscles; the shield is adequately extended in order to provoke stretching and activation of the musculature although not arriving up to the form given it that is performed and not customized for the patient. Lingually, the appliance has a frontal lingual ramp for the re-reaching of lingual posture and two lateral wings which increase the re-education effect of the frontal elevator.

In summary, the specific design characteristics of the MULTI SYSTEM are:

- Vestibular Shield
- Lingual Elevator
- Lateral Wings
- Occlusal Plane
- Mandibular Prolusion

THE COMMON CHARACTERISTICS OF THE MULTI SYSTEM APPLIANCES

The MULTI SYSTEM of Orthodontics represents an integrated series of myofunctional appliances that allow the orthodontist to utilize the device that is most suitable based on the age and characteristics of the patient's malocclusion.

The MULTI series of appliances are primarily myofunctional in nature and, as such, each appliance is designed for specific functions. All the appliances in the series have various characteristics in common, although each has unique features rendering them case specific for various stages of treatment.

SPECIFIC CHARACTERISTICS OF THE MULTI SYSTEM APPLIANCES

The MULTI appliances, Multi-S, Multi-T, Multi-P are designed to be used independently of other orthodontic devices. As part of their design, dental tooth eruption/positioning guides are included as innovative additions to the orthodontic appliances. The extent of the guide varies among the appliances to follow the development of tooth eruption with age. Multi-T contains a guide only for the incisors; Multi-T/M contains guides for the incisors and canines; Multi-P has additional guides for premolars. Multi-T/M, was designed to be used in combination with conventional orthodontic treatment, and therefore does not have any dental guides.

Follow-up of eruption of the first molars it is often preferable to utilize Multi-T/M that is applicable from 6 to 9-10 years of age.

Beyond age 13-14, it is advisable to use Multi-T/B in association with conventional orthodontics.

When should the MULTI series of appliances be used? As previously discussed, these are primarily myofunctional devices. They are designed to stretch the lateral and periodontal muscles to generate strength in order to modify the skeletal and/or dental relationship. As per classical myofunctional therapy, their main use is in Class II and certain Class I cases and they possess three principal functions:

a. UPPER RIDGE: Dental tipping and guide for tooth eruption.

b. SKELETAL: Possible interference with the growth of the jaw bone; increase of lower jaw growth; remodelling and modification of the TMJ.

c. MODIFICATION OF THE FUNCTIONAL MATRIX ACTIVITY: MULTI family appliances do not require impressions or the need for a dental laboratory. This is very important because most patients would prefer to avoid having impressions taken, and initiating orthodontic treatment without the need for impressions may incline the patient and parents to be more receptive with orthodontic treatment.

In addition, when the dental laboratory is by-passed, the MULTI SYSTEM becomes exchangeable with the office procedure without a costly laboratory fee.

References


CASE # 1:
Roberto; age 7
Class 1, Crowding upper and lower, Cross-Bite, Deep-Bite

Treatment Plan: Multi-T for correcting the cross-bite, reshaping the arches, and correcting the deep-bite. Quad-Helix for gaining space and mesio-distal rotation of upper first molars.

In summary, the specific design characteristics of the MULTI SYSTEM are:

a. Vestibular Shield
b. Lingual Elevator
c. Lateral Wings
d. Occlusal Plane
e. Mandibular Protrusion
CASE # 2:  
Ivan; age 6  
Class II, Open-Bite, Thumb Sucking

Treatment Plan: 2 Phase Treatment

Phase #1: Habit correction, Facial Axis Control: Multi-S and Re-education

Phase #2: Class II Correction, smile analysis and gummy smile correction: Fixed Appliances

After phase 1 treatment

Superimposition before and after: Xv-Pm on Pm mandible unlocked, over-jet correction with lower incisor movement to lingual

Before treatment

Superimposition before and after: Ba-Na on CC Facial Axis controlled

Our therapeutic protocol calls for a three-step treatment sequence to address the Functional Matrix:

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2. Mechanical Stage: use myofunctional appliances in association with conventional fixed appliance therapy.

3. Retentive Stage: use myofunctional orthodontics at the end of mechanical treatment to promote adaptation of the Functional Matrix to the new occlusion.

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Ivan; age 6
Class II, Open-Bite, Thumb Sucking

Treatment Plan: 2 Phase Treatment

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Treatment Plan: 2 Phase Treatment

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3. Retentive Stage: use myofunctional orthodontics at the end of mechanical treatment to promote adaptation of the Functional Matrix to the new occlusion.
CASE # 3 : Erica; age 7
Class II, Upper and Lower anterior crowding, Deep-Bite

Treatment Plan: 2 Phase Treatment

Phase # 1: Deep-Bite correction, crowding correction, Facial Axis control:
Multi-P Low Volume for 13 months

Phase #2: Class II correction, Occlusal Plane inclination correction: Fixed Appliances

Superimposition Palatal Plane on ANE
Real intrusion of upper incisors

10 Months after treatment without any retention: the case is stable

Superimposition Xi-Pm on Pm
No advancement or inclination of the lower incisors

Before treatment

After treatment
Orthodontic Literature Review: Muscular Function

We have searched the Pubmed index from 1960 to 2008 to analyze interest in muscle action/interaction in orthodontics over this time period.

Papers (110) were divided into two groups:

Group A: Meta analysis or Theories
Group B: Clinical Trials

As shown in Graph 1, interest in the study of muscular function in orthodontics increased during this time period.

An increasing interest on muscular function and muscle interaction in orthodontics supports our analyzing the effects of myofunctional appliances in our patients. The MULTI Appliances represent a modern and complete system to apply the increased focus on muscular function to clinical orthodontics.
Superior Quality Maximizes Satisfaction.

RMO’s premium Schweickhardt instruments represent the finest quality available at any price. Each Schweickhardt instrument is precisely manufactured to our specifications in Germany with hardened inserts that can be sharpened or replaced, resulting in a more economical product over time than disposable instruments. All Schweickhardt instruments are crafted of 100% surgical stainless steel, are forged, finished by hand, and carry a superb warranty.

- Premium quality instruments result in a more satisfying experience because they allow for a more precise and ergonomic work process day to day, year over year.
- RMO® Schweickhardt inserts are made from a special alloy and are applied to the plier with a highly sophisticated soldering technique. Schweickhardt insert alloy combines hardness (around 62 HRC) with high corrosion resistance.
- All Schweickhardt pliers and inserts are milled on high precision machines and finished by hand by expert craftsmen. In addition, all pliers are protected with a tungsten carbide coating for improved wire grip and maximum reliability.
- All box locks and screw joints are produced with exacting care to ensure a smooth and precise action throughout the entire working angle.
- All edges are carefully chamfered for increased safety - (no pinching or wounding of soft tissue).
- Because the instruments are not chrome plated, they can be subjected to a variety of sterilization methods such as ultrasonic, dry heat, chemclave, autoclave, and cold sterilization.
- All Schweickhardt pliers are designed to be run in a no-rinse model to remain open during sterilization cycle.

Because of the non-stainless characteristics of a vast majority of orthodontic plier tip materials, between rapid cycle turn-around and large load capacity, it was the logical rapid Dry Heat Sterilization became the most widely used method of infection control in this dental specialty. Between rapid cycle turn-around and large load capacity, it was the logical choice.

Dry Heat remains one of the most sensible choices for dentists today. With the advent of new sterilization technology, such as ethylene oxide, autoclave, and filtered water, orthodontists have a more diverse array of sterilization methods available to them. Before choosing a method of sterilization, it is important for practitioners to understand the characteristics of the orthodontic instruments and how these characteristics can affect sterilization. As a result, Dry Heat remains the method of choice for most orthodontists today.

To order, please contact your RMO® Sales Representative or call 800.525.6375