The 6-elements orthodontic philosophy: Treatment goals, classification, and rules for treating

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The *American Journal of Orthodontics and Dentofacial Orthopedics* is celebrating its 100-year anniversary. For more than half of those years, I have practiced and been a student of orthodontics. For those reasons, Dr Behrents invited me to write a guest editorial about some personal perspectives regarding orthodontics past, present, and future.

When the *American Journal of Orthodontics* was commissioned in 1915, orthodontics had no scientific treatment goals, a classification system that was not positionally accurate, and brackets with no built-in features. The same was true 43 years later when I began my career in 1958. Those uncertainties provided great opportunities for research.

I caught the research bug in 1960. Since then, I have devoted every other week of my orthodontic career to searching for solutions to those seemingly perpetual weaknesses. Retrospectively, I would have preferred to have been taught as a resident what has taken me 57 years of research to learn. My treatment results would have immediately been more satisfying, and I could have devoted all those research weeks to playing golf.

This guest editorial will be an overview of my research findings. The most important are believed to be orthodontics' most scientific treatment goals for the 6 areas for which orthodontists have diagnostic responsibility (arches, anteroposterior jaw positions, maxilla width, jaw heights, chin prominence, and occlusion), a positionally accurate classification system, and effective and efficient rules for treating. Collectively, they are the fundamental components of the 6-elements orthodontic philosophy.

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My first research project began in 1960. It involved trying to gain a better understanding about American Board of Orthodontics (ABO) posttreatment standards. Where better for a rookie orthodontist to learn about treatment excellence than from the ABO treatment results displayed at national orthodontic meetings? The research findings showed a large posttreatment tooth-position range and consistent undercorrection of interarch relationships. The common characteristic of that posttreatment sample was that each orthodontist's treatment results were, in some ways, uniquely different.[1]

For another perspective about what may constitute excellent tooth positions and interarch relationships, I decided to search for persons with naturally harmonious dentitions and take impressions. Once the sample reached 120 subjects, they were studied to look for common characteristics. Six were found, and they were called the 6 keys to normal occlusion.[2,3]

Later, the occlusal plane was used as the landmark, and the facial axis of each clinical crown was used as the referent to quantify the angulations and inclinations of the teeth of the 120-cast sample.[4] The tooth positions for each tooth type, regardless of the patient's race or sex, were found to be so similar that, in the 1970s, that information led to my inventing the standard straight-wire appliance.[5] It was designed to be a fully programmed appliance for arches not requiring any tooth to be translated. A fully programmed appliance is one that, when properly designed and sited, will correct tooth positions with few, if any, archwire bends. Later, translation brackets were designed to be used on teeth that require bodily mesial or distal translation. Teeth that required translation were those that were consistently undercorrected on the ABO treatment results.[1]

Translation brackets provide the angulation and rotation countermoments needed for teeth that need to truly translate. When the right combination of

standard and translation brackets is correctly prescribed for the mesial or distal treatment needs of each patient, then that appliance will be fully programmed. It is difficult and rare for posttreatment tooth positions and for occlusal interfacing to meet the 6 keys and the 6 elements functional and occlusion standards when standard brackets are used on patients needing tooth translation.[1] A fully programmed appliance is essential for orthodontists who want to routinely provide patients with the 6 keys and occlusions that function gnathologically.[5-7] However, fully programmed appliances are not the whole story.

In the 1980s, I undertook a new research project to search for a solution to orthodontics' long-standing extraction vs expansion and archwire shape controversies. Those controversies existed because there was no scientific treatment goal for the anterior or lateral borders of an arch. If that information were known before treatment, it could be determined whether there would be enough room for all teeth when an arch is diagnostically taken to those borders.

The 120-cast sample was revisited to search for anterior and lateral arch-border answers. This led to the discovery of the WALA ridge.[8,9] WALA is an acronym for Will Andrews and Larry Andrews, who collaborated in the discovery. The ridge is the most prominent portion of a mandible's mucogingival junction.

The mandibular casts of the 120-cast sample were used to quantify the faciolingual distance between each crown's facial axis point and the WALA ridge.[9] The range was so small that the facial axis points qualified as the 6-elements referents for diagnosing the anterior and lateral borders of a mandibular arch relative to the WALA ridge, which qualified as the 6-elements landmark. The WALA ridge also serves as the template for forming archwires that will match the anterior and lateral borders of the WALA ridge. That shape will be uniquely correct for each patient regardless of race or sex.

The 6 keys study in the 1960s did quantify the depth of the occlusal borders of the mandibular arches. It was found to range from 0 to 2.5 mm. The location of an arch's distal border is determined by the sum of the mesiodistal diameters of the teeth included in treatment. However, the anterior and lateral borders of the sample were not considered at that time, so to that extent, the 6 keys have been incomplete.

Archwires that are shaped differently than the WALA ridge may align the teeth and improve the smile, but the roots will not be centered within the alveolar process and over basal bone. The more an archwire shape differs from the WALA ridge shape, the more likely there will be undesirable side effects to the gingiva, alveolar process, roots, or all three.

An arch will be uniquely harmonious for each person when its components have the same characteristics found to be consistently present on the casts of the 120-cast sample. The components are teeth individually (positions), teeth collectively (anterior, lateral, occlusal, and distal borders), and their supporting tissues. Orthodontists do not directly treat the gingiva, alveolar process, or roots, but it is important to not abuse them.

Arch diagnosis involves using pretreatment casts (plaster or digital) to measure the arch's pretreatment arch length discrepancy. The casts and lateral headfilm are then used to compute the effects on the pretreatment arch discrepancy that will result from hypothetically correcting the pretreatment borders to match the border characteristics of the 120-cast sample. Those hypothetical corrections can cause a pretreatment arch to become more or less crowded. If the diagnosis indicates excess room, then treatment will require translating posterior teeth mesially. If the diagnosis indicates insufficient room, then the treatment options are to move posterior teeth distally or to extract. If the crowding is beyond what can be accomplished by moving posterior teeth distally, then extractions are required.

The WALA ridge solves orthodontics' long-standing controversies regarding the anterior and lateral arch-border positions and archwire shapes, and whether to extract or expand, or both. It also solves the maxillary arch-border and the maxilla width controversies because a uniquely correct mandibular arch's lateral borders serve as the landmark for the lateral borders for both the maxillary arch and the maxilla.[10]

Also in the 1980s, I undertook a research project to search for scientific treatment goals for anteroposterior tooth and jaw positions. This required a large profile sample of subjects judged to have facial harmony. The intents were to search for common characteristics and, if so, to find landmarks and referents to quantify them.

The research began by finding and compiling over 1000 profile images of persons judged to have facial harmony. A prerequisite was for the forehead and the maxillary central incisors to be visible so that the entire profile could be seen. For this study, a person's forehead and maxillary incisors were considered to be a part of the face when the forehead is free of hair and the lips allow the maxillary incisors to be seen, such as when smiling or laughing.[11] This is an important consideration because people care a lot about how they look in profile in social situations. The sample included all races and both sexes. Most of the images were found in magazines.